TECHNICAL PROCEDURES
VOLUME SEVEN

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Apple Technical Procedures

Volume Seven

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Modems

Apple Technical Procedures

Modems

Technical Procedures

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Modems Technical Procedures

Section 1

300/1200 Modems: Troubleshooting and Take-Apart

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TROUBLESHOOTING

Introduction

Most of the problems with modems will occur during the installation procedures. Other problems may occur only with certain baud rates or modes of operation. The purpose of this document is to give Apple Dealer Service-persons step-by-step checkout procedures to test, evaluate, and diagnose any failure related to the operation of either the Apple 300 or Apple 1200 MODEMs. These procedures can be performed using either an Apple II+, Apple IIe or Apple ///. For testing and troubleshooting of modems connected to Macintosh or Lisa systems, refer to the Modem Manual (Part II) for those systems.

A. Modem Self-Test

Equipment Required:

Modem 300/1200 User's Manual (Part 1: Reference)
Apple II+, IIe, or /// system with drive and monitor
Apple Term program diskette (Apple Term II or Apple Term ///)
Super Serial Card (for Apple II+ or IIe only)
Modem 300/1200 User's Manual (Part II for Apple II or ///)
NOTE: There are two Part II manuals, one for Apple II+ and IIe systems, and one for Apple /// systems. Use the one that matches your system.

1. Connect the modem to a telephone line according to the instructions on page 14 (start at the top of the page) of the Modem 300/1200 User's Manual (Part 1: Reference).

2. Complete the modem hook-up to your computer according to the instructions in chapter 1 of the Modem 300/1200 User's Manual (Part II).

3. Run the self-test given in chapter 1 (see Testing with the Self-Test Procedure) of the Modem 300/1200 User's Manual (Part II).

4. After completing the self-test, press and hold down the <OPEN-APPLE> key and type "Q" (IIe) or hold down the <ESCAPE> key and type "Q" (II+) to return to the main menu.

5. Type "C" to enter the **Change Configuration** menu. You will now select a different speed and repeat the self test.

6. Use the arrow keys (IIe) or arrow keys and space bar (II+) to select 110 baud.

7. Repeat steps 3 and 4. Press <ESCAPE> to return to the main menu.

8. If you are testing a 300 baud modem, skip this step and go on to step 9. Type "C" to enter the **Change Configuration** menu. Use the arrow key (IIe) or <SPACE> (II+) to select 1200 baud. Repeat steps 3 and 4.

9. Return the baud setting to 300 baud.

10. If the self-test passes skip over this step and perform the **MODEM VERIFICATION TEST** on the next page. If the self-test fails, check your installation using the checklist below:

    - o Verify the setting of the switches on the back of your modem.
    - o Is the modem data cable securely connected to the computer and to the modem?
    - o Is the modem power module connected to the modem? **NOTE:** Inspect the modem power module connector for bent or missing pins?
    - o Is the modem power module plugged into an electrical outlet?
    - o Is the modem turned on?
    - o Verify the setting of the DIP switches on the Super Serial Card (Apple II+ or IIe only).
    - o Verify that the jumper block on the Super Serial Card has its triangle pointing to the word MODEM (Apple II+ or IIe only).

If no problems are found during the installation check, replace the following modules (in the order listed) one at a time and rerun the self-test:

- o power module
- o modem data cable
- o modem PCB

After isolating and repairing the problem, continue on to the **MODEM VERIFICATION TEST** on the next page.

B. Modem Verification Test

This test will verify the correct operation of the modem and the telephone lines.

Equipment Required:

Apple II+, IIe, or /// system with drive and monitor
Super Serial Card (if Apple II+ or IIe is used)
Apple Term program diskette
Local telephone line and a user service

NOTE: The user service may be a local bulletin board or any data service as long as the baud rate and protocol are known and can be verified. Do not attempt to test a modem by dialing an unverified user service. The results will be very confusing.

1. Obtain the telephone number of a compatible user service.

2. From the Apple Term main menu, type "U" to enter the phone directory menu.

3. Add the telephone number of the user service by holding down the <OPEN-APPLE> key and typing "A" (IIe) or holding down the <CONTROL> key and typing "A" (II+). The cursor will appear at the first available line on the telephone list.

4. Type a name or label that lets you identify the number to be added. Press <RETURN> and the cursor will move to the number column.

5. Type the complete telephone number including any prefixes required to get an outside line. Do not use spaces or dashes to separate parts of the telephone number. Press <RETURN> when you are finished entering the telephone number.

6. Press <ESCAPE> to get out of the phone directory screen and return to the main menu.

7. Type "E" to enter the terminal mode.

8. Hold down the <OPEN-APPLE> key and type "D" (IIe) or hold down the <CONTROL> key and type "D" (II+) - this will automatically dial the number you entered.

NOTE: If the **CONNECT** message appears on your monitor screen and a message from the user service you dialed appears, your modem is working properly. If a **NO CARRIER** message appears on your screen, your modem was unable to connect you with the number selected and you should replace the following components (one at a time) in the order listed:

- o telephone cable
- o modem power module
- o modem PCB
- o modem data cable

After isolating and repairing the problem, verify correct operation by running the **MODEM VERIFICATION TEST** again.

C. Back-to-Back Test

This is an optional test that requires two complete computer systems and two identical modems. Perform this test only when a customers modem does not function correctly, but no problem can be found by running the **SELF-TEST** or **MODEM VERIFICATION TEST.**

Equipment Required:

- (2) Apple II+, IIe, or /// systems with drives and monitors
- (2) Super Serial Card (one for each computer if Apple II+ or IIe is used
- (2) Apple Term program diskettes
- (2) identical modems (one modem must be a known good unit)
- (2) local telephone lines (two separate phone lines must be used)

If the modem fails any steps of this procedure, replace the modem power module and repeat the test. If that does not cure the problem, replace the modem PCB and repeat the test. If the modem passes all steps of this procedure, the **SELF-TEST,** and the **MODEM VERIFICATION TEST,** but the customer still cannot get the modem to work at their site, have the customer contact the telephone company to investigate their telephone line.

1. With both modems installed according to the User's Manual instructions, turn the computers and modems on and boot the Apple Term software on both systems.

2. On the system with the suspected bad modem, type "U" to enter the phone directory menu.

3. Add the telephone number of the known good modem to the phone directory by holding down the <OPEN-APPLE> key and typing "A" (IIe) or holding down the <CONTROL> key and typing "A" (II+). The cursor will appear at the first available line on the telephone list.

4. Press <RETURN> and the cursor will move to the number column.

5. Type the telephone number of the known good modem. Do not use spaces or dashes to separate parts of the telephone number. Press <RETURN> when you are finished entering the telephone number.

6. Press <ESCAPE> to get out of the phone directory screen and return to the main menu.

7. Type "E" on both computers to enter the terminal mode.

8. On the system with the suspected bad modem, hold down the <OPEN-APPLE> key and type "D" (IIe) or hold down the <CONTROL> key and type "D" (II+) - this will automatically dial the number you entered (the known good modem). The **CONNECT** message should appear on your monitor screen; if it does, go to step 9. If a **NO CARRIER** message appears on your screen, check the setup of both modems and computers, then dial again. If a **NO CARRIER** message appears again, turn both modems and computers off, replace the PCB in the suspected bad modem, and start the test again from step 1. If the test passes, the modem PCB was faulty.

9. On the system with the suspected bad modem, type a short message and verify that it is displayed on the screen of the system with the known good modem.

10. On the system with the known good modem, type a short message and verify that it is displayed on the screen of the other system (the suspected bad modem).

11. On the system with the suspected bad modem, hold down the <OPEN-APPLE> key and type "H" (IIe) or hold down the <ESCAPE> key and type "H" (II+) to hang up the modem. The screen should now have the message **NO CARRIER.**

12. On the system with the known good modem, hold down the <OPEN-APPLE> key and type "Q" (IIe) or hold down the <ESCAPE> key and type "Q" (II+) to return to the main menu.

13. Type "U" to enter the phone directory menu.

14. Add the telephone number of the suspected bad modem to the phone directory by holding down the <OPEN-APPLE> key and typing "A" (IIe) or holding down the <CONTROL> key and typing "A" (II+). The cursor will appear at the first available line on the telephone list.

15. Press <RETURN> and the cursor will move to the number column.

16. Type the telephone number of the suspected bad modem. Do not use spaces or dashes to separate parts of the telephone number. Press <RETURN> when you are finished entering the telephone number.

17. Press <ESCAPE> to get out of the phone directory screen and return to the main menu.

18. Type "E" to enter the terminal mode.

19. Hold down the <OPEN-APPLE> key and type "D" (IIe) or hold down the <CONTROL> key and type "D" (II+) - this will automatically dial the number you entered (the suspected bad modem). The **CONNECT** message should appear on your monitor screen; if it does, go to step 20. If a **NO CARRIER** message appears on your screen, check the setup of both modems and computers, then dial again. If a **NO CARRIER** message appears again, turn both modems and computers off, replace the PCB in the suspected bad modem, and start the test again from step 1. If the test passes, the modem PCB was faulty.

20. Hold down the <OPEN-APPLE> key and type "H" (IIe) or hold down the <ESCAPE> key and type "H" (II+) to hang up the modem. The screen should now have the message **NO CARRIER.**

21. Hold down the <OPEN-APPLE> key and type "Q" (IIe) or hold down the <ESCAPE> key and type "Q" (II+) to return to the main menu.

22. Type "C" to enter the **Change Configuration** menu. Use the arrow keys to select touch-tone dialing.

23. Press <ESCAPE> to return to the main menu.

24. Type "E" to enter the terminal mode.

25. Hold down the <OPEN-APPLE> key and type "D" (IIe) or hold down the <CONTROL> key and type "D" (II+) - this will automatically dial the number you entered.

26. When the **CONNECT** message appears, type a short message and verify that it is displayed on the screen of the suspected bad modem. If the **CONNECT** message did not appear,or if the message you typed was not displayed on the suspected bad modem, replace the PCB in the suspected bad modem and run this test again.

TAKE-APART

NOTE: There are two types of Modem 1200 PCB's, one that requires a sprayed case and one that does not. The sprayed Modem 1200 service stock and exchange modules cannot be used to repair the unsprayed Modem 1200's. See the Illustrated Parts List for the differing service stock part numbers for the sprayed case Modem 1200 and the unsprayed case Modem 1200.

PCB Removal

1. Carefully pry off the two rubber feet from the bottom front of the modem.

2. Remove the four screws holding the two case halves together.

3. Remove the bottom cover and set it aside.

4. Lift out the modem PCB.

5. Remove the service spare modem from the shipping box. Notice that the top and bottom covers are labeled "service use only". These covers must be returned with the faulty board for service credit.

6. Remove the service replacement board in the same way as you did the customers board. Replace the bad board with the service spare, after first confirming that the two are the same model.

7. Place the bad board on the service covers and fill out the service repair order information. Ship the bad board and/or modem power module to the Apple Service Center for credit.

Modems

Section 2 – Apple Personal Modem

❑ CONTENTS

2.2 Introduction
2.2 Equipment Required
2.3 Power Test
2.4 Computer Test
2.5 Self-Test Mode

❑ INTRODUCTION

Most of the problems with modems will occur during the installation procedures. Other problems may occur only with certain baud rates or modes of operation.

> ***Note:*** The Apple Personal Modem has no DIP switches to set. The baud rate, parity, and duplex settings for the modem are software controlled. The three baud rates available are 110, 300, or 1200. Verify all configuration settings on the application being used.

The Apple Personal Modem is composed of two pieces: the power connector (Figure 1, #1) and the body (Figure 1, #2). If the body is defective, *both* pieces must be returned to Apple. If the power connector is defective, this piece can be obtained separately.

For more information, refer to the *Apple Personal Modem User's Manual.*

Equipment Required

The following equipment will be needed for all procedures:

Apple Personal Modem
Apple Personal Modem User's Manual
Phone line
Appropriate cables for connection to computer

One of the following combinations:

Computer	Software
Apple II Family	Access II or AppleTerm
Macintosh	MacTerminal
Macintosh XL	MacTerminal or LisaTerminal

❑ POWER TEST

The modem will beep when it is first plugged in, which means that it is receiving power and its circuitry is operating properly.

If the modem doesn't beep when it is plugged in, check the following:

1. Turn the volume control clockwise (see Figure 2), and try plugging in the modem again.

2. Verify that the power connector is firmly in place. Push it all the way in until it clicks into position. Try plugging in the modem again.

3. Exchange the whole unit. Try plugging in the new modem.

4. Continue to "Computer Test."

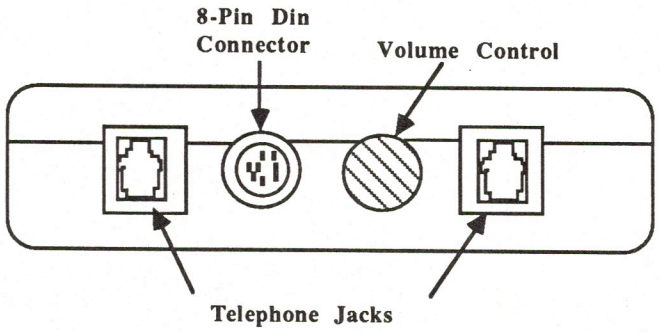


FIGURE 2

❑ COMPUTER TEST

Note: To set up the modem, refer to the *Apple Personal Modem User's Manual*, Chapter 1.

To be sure the modem and computer are communicating, do the following:

1. Load the communications software, turn on the computer, and verify the configuration settings.

   If you do not know how to use the software, refer to the appropriate software manual.

2. Enter terminal mode (if applicable). Type AT and press <Return>.

   If everything is connected properly, the screen will display: **OK**.

   If you type AT and press <Return> a few times and don't get an **OK** response, do the following:

   a) Verify that the software is set for 110, 300, or 1200 baud.

   b) Power off the computer and unplug the modem. Verify that the Super Serial Card DIP switches are set correctly (Apple II users only), and that the cable and connections are correct (refer to the *Apple Personal Modem User's Manual*, Chapter 1).

   c) Plug in the modem, turn on the computer, boot the communications software, and enter terminal mode.

   d) Type AT and press <Return>. If you do not get an **OK** response, exchange the whole unit and try again.

3. Continue to "Self-Test Mode."

❑ SELF-TEST MODE

You can run an Analog Loopback Test on your modem by following these instructions. (More information on these procedures can be found in *Apple Personal Modem User's Manual*, Appendix D.)

1. Load your software and enter terminal mode.

2. Type the modem command string ATS16=1D and press <Return>.

   The modem speaker will turn on, allowing you to hear a dial tone or high-pitched tone. The message **CONNECT** (or **CONNECT 1200**) will be displayed on your screen.

3. Type a short test message—anything at all.

   As you type, the modem directs the characters to loop back to the computer screen. If you can see what you're typing, the modem is functioning. (Don't worry if the <Return> key doesn't advance the cursor to the next line.)

4. To exit the test, wait one second and type +++ (three pluses) to go back to command mode.

   Your screen should display the message **OK**.

5. Type ATZ and press <Return>.

   This command will turn off the self-test mode. An **OK** response will appear on the display.

If the modem fails to function, exchange the whole unit and run the self test again.

For further information on specific problems, refer to the *Apple Personal Modem User's Manual*, Chapter 3.

Modems

Illustrated Parts List

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IPL.3 Apple 300/1200 Modems (Figure 1)
IPL.5 Apple 300/1200 Modems – Cables and Connectors (Figure 2)
IPL.7 Apple Personal Modem and APM Modem Cables (Figure 3)

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the Apple Personal Modem, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs* manual for prices.

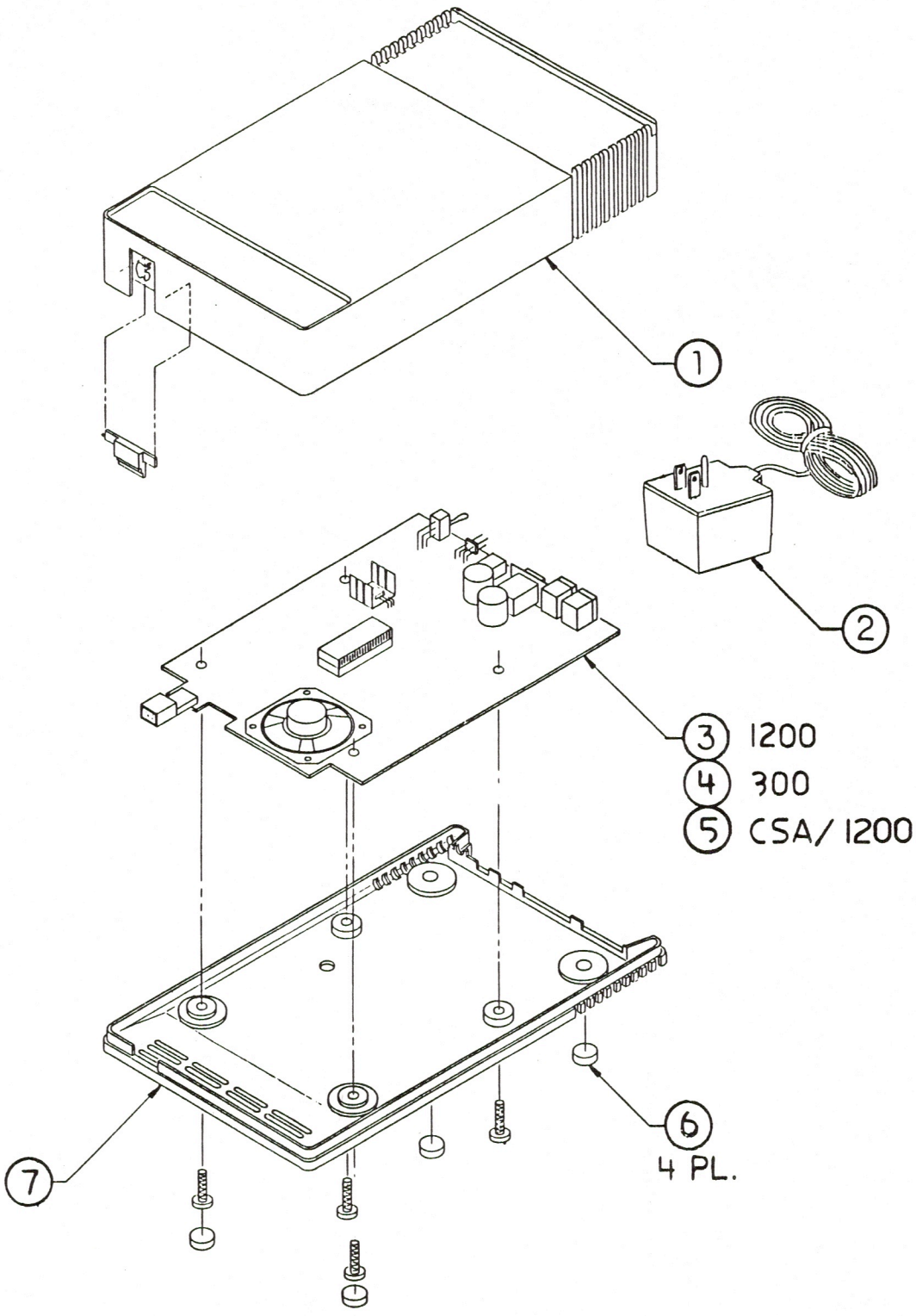


FIGURE 1

❑ APPLE 300/1200 MODEMS (Figure 1)

Item	Part No.	Description
1	815-0790	Top Cover
2	076-8077	Transformer, Cable Assembly
3	661-75164	PCB, Modem 1200
4	661-75165	PCB, Modem 300
5	661-0293	PCB, Modem 1200, w/CSA
6	865-0003	Rubber Foot
7	815-0791	Bottom Cover

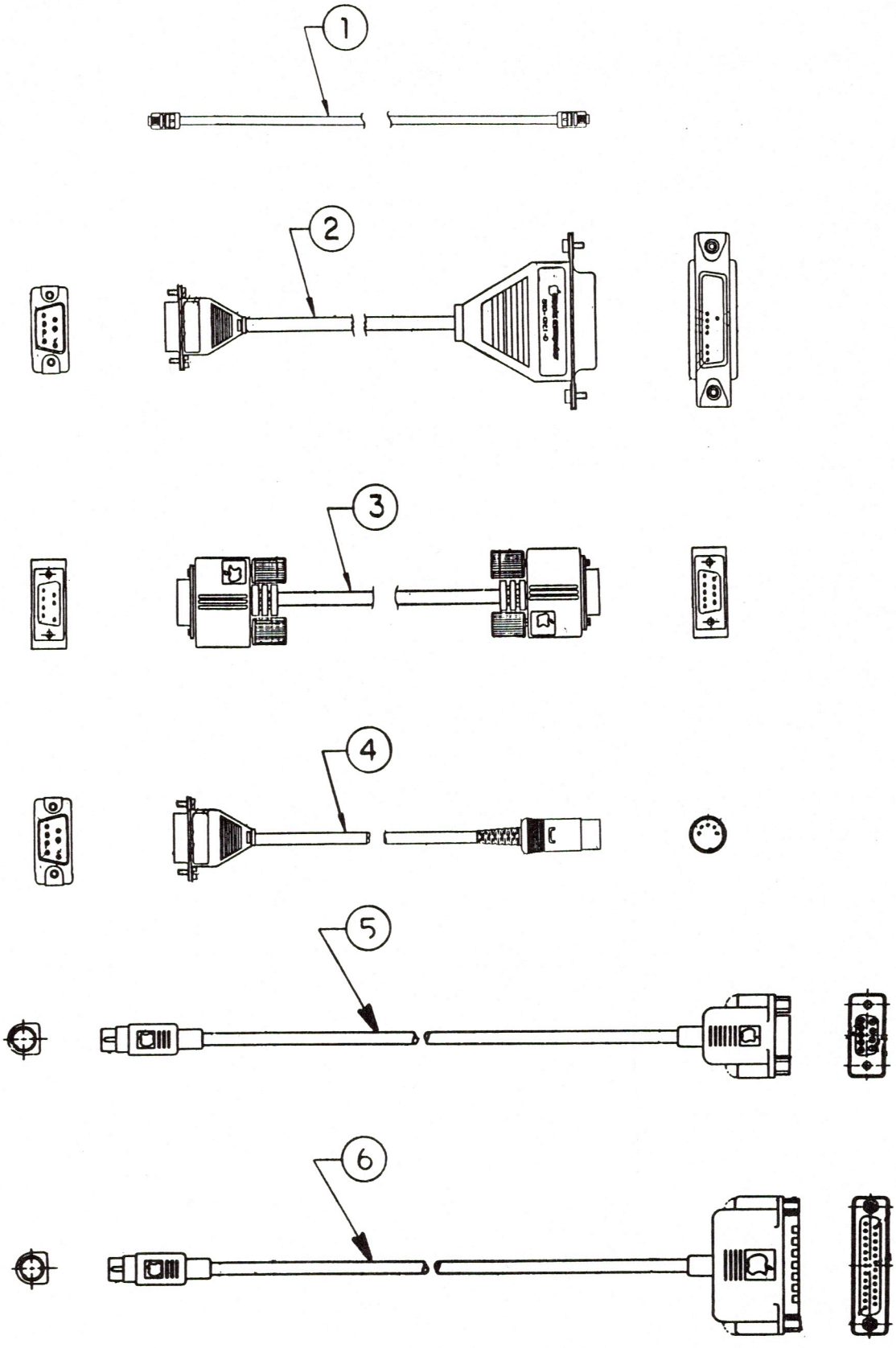


FIGURE 2

❑ APPLE 300/1200 MODEMS – CABLES AND CONNECTORS (Figure 2)

Item	Part No.	Description
1	076-8075	Cable Assembly, RJ-11
2	590-0121	Cable Assembly, Interface (II, III, Lisa/Macintosh XL)
3	590-0197	Cable Assembly, Interface (Macintosh)
4	590-0192	Cable Assembly, Interface (IIc)
5	590-0553	Cable Assembly, Macintosh Plus Peripheral Adaptor
6	590-0550	Cable Assembly, Apple IIGS Peripheral Adaptor

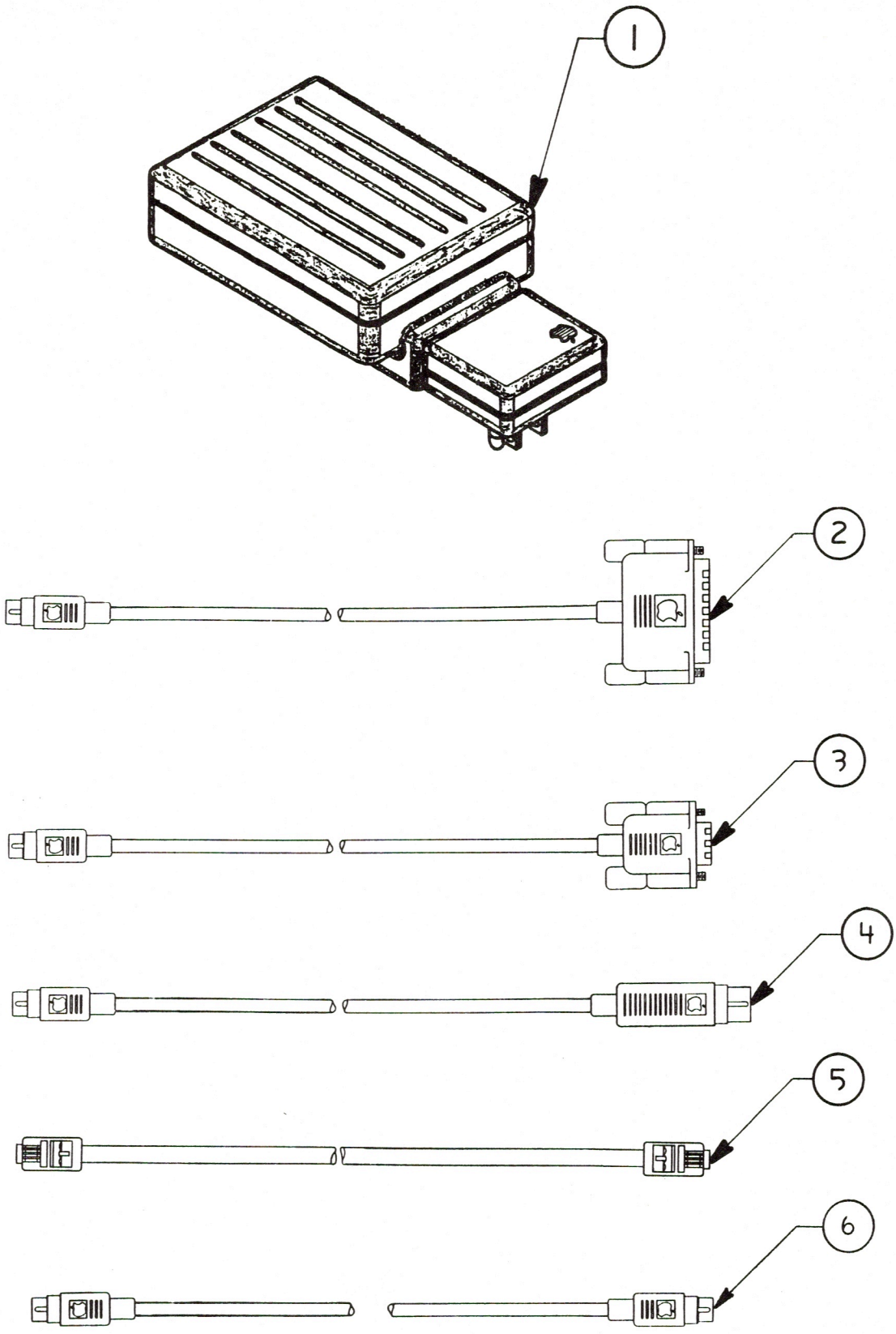


FIGURE 3

❑ APPLE PERSONAL MODEM AND APM MODEM CABLES (Figure 3)

Item	Part No.	Description
1	661-0313	Main Body, Apple Personal Modem (includes Power Connector)*
	933-0001	Plug Head, Power Connector (only)*
2	590-0555	Cable, APM to Apple II, II+, IIe, Apple III, Macintosh XL
3	590-0551	Cable, APM/ImageWriter II to Macintosh
4	590-0554	Cable, APM/ImageWriter II to Apple IIc
5	076-8075	Cable Assembly, RJ-11
6	590-0552	Cable, APM/ImageWriter II to Macintosh Plus

* The whole unit module includes the power connector. If desired, the power connector can be ordered separately.

You Outta Know…

Apple Technical Procedures

You Oughta Know...

Technical Procedures

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Apple Technical Procedures

You Oughta Know...

Section 0 – Technical Procedures

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❑ HOW TO USE THE TECHNICAL PROCEDURES

The *Apple Service Technical Procedures* are your major reference as an Apple Service Specialist. The Technical Procedures are arranged by product, and for each product there are several sections of procedures. Most products have Take-Apart, Diagnostics, and Troubleshooting sections, and some have Adjustments and other procedures. Many products also have an Illustrated Parts List. Each section and page is numbered. At the bottom of each page the section number is given first, then the page number, and they are separated by a period. For example, page 1.5 of the *Apple II Technical Procedures* is the fifth page of Section 1 (Apple II Take-Apart). Each section begins with a table of contents so that you can find the procedure you need quickly.

Take-Apart

The Take-Apart section for each product gives step-by-step procedures for removing and replacing individual assemblies or modules of that product. Suppose you have determined that the motherboard on an Apple II is faulty. How do you find the replacement procedure? Turn to the **Apple II** tab in the *Technical Procedures* manuals. Find the Apple II Table of Contents, and you'll see that Take-Apart is Section 1. (Both on this page and on page 1.1, you will find the Table of Contents for the Take-Apart section.) "Removing the Motherboard" is on page 1.5.

Adjustments

In the *Technical Procedures* for some products, there will also be a section called "Adjustments." If a module is malfunctioning, it may simply need an adjustment. The Adjustments section will tell you which adjustments can be made and how to make them. The Apple ImageWriter II Printer procedures (under the *ImageWriter II* tab) contain an example of an Adjustments section.

Diagnostics and Troubleshooting

For many products, there exists a diagnostic diskette or diagnostic ROM card, which diagnoses *some* problems automatically. If a diagnostic tool exists for a product, there will be a Diagnostics section to tell you **how** to use it.

The Troubleshooting section contains tables or flowcharts that will help you isolate problems to a faulty or misadjusted module or part. If there is a diagnostic tool, the Troubleshooting section will tell you **when** to use it.

Using Troubleshooting Charts

Troubleshooting charts usually list the causes of problems in order of likelihood. If a chart gives you such a list and no other instructions, try the first swap or adjustment and then test the product again. If the problem remains, try the next instruction on the list.

Troubleshooting charts often use abbreviations or short titles. If you don't understand what they mean, look in the Table of Contents, Illustrated Parts List, or Adjustments section for a similar word and a fuller explanation.

Summary

In summary: The Diagnostics and Troubleshooting sections help you find what's wrong with a product. The Take-Apart and Adjustments sections tell you how to fix it. Some products have an Illustrated Parts List that describes the parts, shows their locations, and gives their part numbers.

In general,

1. Look over and, if possible, practice all the technical procedures for any new product before you repair it for a customer.

2. Whenever a procedure tells you to do something but doesn't give step-by-step instructions, turn to the table of contents to find more information on that subject.

   Note: Check your *Service Programs Manual* for the list of available videotapes that will assist you in performing technical procedures.

❑ RECOMMENDED TECHNICAL REFERENCES

The manuals marked with an asterisk (*) in the list below can be purchased through the Media Exchange Program. Check your *Service Programs Manual* for prices and availability.

	Title	Part Number
	Apple Pascal Operating System Reference Manaul	030-0100
*	Standard Input/Output Drivers Manual	030-0143
*	Universal Parallel Interface Card Manual	030-0255
	Super Serial Card Manual	030-1258
*	Parallel Interface Card Manual	030-0371
*	80 Column Text Card Manual	030-0408
*	Apple II Reference Manual	030-0004
*	Apple IIe Owner's Manual	030-0356
*	Apple IIe Reference Manual	030-0357
	Apple IIe, IIc AppleSoft Tutorial	030-0358
*	About Your Enhanced IIe	030-1141
*	Apple IIc Reference Manual	030-0814
*	Apple IIc Programmer's Guide	030-1196
*	Apple IIc Memory Expansion Card Manual	030-1330
	Apple /// Owner's Guide	030-0121
	Apple /// Pascal Introduction, Filer & Editor Manual	030-0238
	Apple /// ProFile User's Manual	030-0272
*	Apple /// SOS Reference Manual, Volume I	030-0441
*	Apple /// SOS Reference Manual, Volume II	030-0442
*	Macintosh Plus Internal Drive Manual	030-1245
*	Macintosh Plus Manual	030-1246
*	Macintosh 512K Enhanced Owner's Manual	030-1326
*	Disk Upgrade 512K Enhanced Manual	030-1327
*	Apple IIGS Manual	030-1292
*	Apple IIGS Set Up Guide	030-1294
*	SCSI Manual	030-3118

❑ DEALER TECHNICAL SUPPORT

The technical support lines listed below are for **your use only. DO NOT give these numbers to your customers.**

The following states use this number: (408) 370-4740

Alaska	Arizona	California
Colorado	Hawaii	Idaho
Montana	New Mexico	Nevada
Oregon	Utah	Washington
Western Nebraska	Western Texas	Wyoming

The following states use this number: (704) 527-4810

Alabama	Connecticut	Delaware
District of Columbia	Eastern Pennsylvania	Florida
Georgia	Maine	Maryland
Massachusetts	Mississippi	New Hampshire
New Jersey	New York	North Carolina
Rhode Island	South Carolina	Tennessee
Vermont	Virginia	

The following states use this number: (312) 439-5533

Arkansas	Eastern Nebraska	Illinois
Indiana	Iowa	Kansas
Kentucky	Louisiana	Michigan
Minnesota	Missouri	North Dakota
Ohio	Oklahoma	South Dakota
Texas	Western Pennsylvania	West Virginia
Wisconsin		

The Canadian areas use these numbers:

(Western) 1 (800) 387-9689
(Central, Eastern) 1 (800) 268-9866
(Toronto Only) (416) 475-2664

Western Territories	Central & Eastern Territories
Alberta	Labrador
British Columbia	New Brunswick
Manitoba	Newfoundland
Northwest Territories	Nova Scotia
Saskatchewan	Ontario
Yukon Territory	Prince Edward Island
	Quebec

You Oughta Know Technical Procedures

Section 1

AppleLink

GENERAL INFORMATION

AppleLink has replaced the Domestic Bulletin Board System and is not available in all International countries. Check with your Apple sales representative on availibility and current information about AppleLink.

If you're currently using AppleLink and need more information, refer to the AppleLink Self-Paced Walkthrough. If you're having trouble using AppleLink, call the AppleLink HelpLine at (408) 973-3309.

THE APPLELINK HTS (HARDWARE TROUBLESHOOTING) FEEDBACK LOOP

What Does the HTS System Consist Of?

HTS articles deal with all hardware repair information in the Tech Info library.

To Use the HTS Identifier:

1. From the Word Search Screen in the Tech Info library enter **HTS** and the **product name** to obtain all of the HTS article titles for that product. If "HTS and the product name" doesn't yield what you're looking for, eliminate HTS and include other logical search words. It could be that what you're searching for might NOT be hardware in nature (though it may appear to be!) and therefore, would not appear under HTS.

2. A Technical Assistance Request (TAR) form (see Figure 1 on the back of this page) appears in all HTS searches. If you are unable to locate information (no database is perfect!), download the form, fill it out, and AppleLink it to your local technical support AppleLink address. Apple's regional technical support persons will respond with an AppleLink E-mail.

How Can I Help HTS to Help Me?

The HTS domain within AppleLink is intended to answer hardware questions on Apple products. That's where we can use your help. When you come across problems that are particularly hard to find or recur a lot, help us help other techs by sending us these problems and their solutions via the TAR form. We'll put them into an HTS document on AppleLink and give you credit with a byline.

THIS FORM IS TO BE USED WHEN REQUESTING TECHNICAL ASSISTANCE.

In order to support you more quickly and efficiently, we request that you submit your queries using this form. The answer will be returned to the same address from which the request was sent. Please SAVE the form to your AppleLink disk so that you will have it available to work with when you are not connected to the network.

When you fill in your form, please do NOT block format as shown below:

System: Apple IIe Enhanced

Problem: After printing a file, user quits from AppleWorks (no save or further actions). Upon....

INSTEAD... please use the following format with all unnecessary spaces removed:

System: Apple IIe Enhanced

Problem: After printing a file, user quits from AppleWorks (no save or further actions). Upon...

We would be very grateful if you would also use this form to share valuable technical information YOU'VE stumbled upon while working with Apple products!

DELETE ABOVE INFO; **SAVE** THE FORM BELOW.

TECHNICAL ASSISTANCE REQUEST FORM (rev. 11/85)

DATE:
REQUESTOR:

SYSTEM (memory, enhanced/unenhanced, # of drives, peripherals, etc.):

SOFTWARE (version number):

DESCRIBE THE PROBLEMS/SYMPTOMS:

ATTEMPTS (what have you tried? the results?):

BEST GUESS (possible cause, possible solution):

REPLY FROM APPLE TECH SUPPORT:

FOR INTERNAL USE ONLY:

FIGURE 1: APPLELINK TECHNICAL ASSISTANCE REQUEST FORM (SAMPLE)

You Oughta Know Technical Procedures

Section 2

Diagnostic Duplication

Contents:

Introduction.....2.2
Diagnostic Chart.....2.2

Introduction

The majority of Apple diagnostics are copyable, but there are some that are copy-protected. If an attempt is made to duplicate copy-protected diskettes, there is a good chance that the original will be damaged.

Diagnostic Chart

Below is a chart which lists the diagnostic, tells if it is copyable with Apple software, and gives the program that will perform the copy.

Diagnostic	Backup and Diskette
Apple II Product Diagnostic, (5.25")	Rev. A Not copyable Rev. B Copyable - DOS 3.3 (COPYA)
Apple II Peripherals Diskette (5.25")	Copyable - DOS 3.3 (COPYA)
Apple II SCSI Diagnostic 1.0	Copyable - System Utilities (2.1.1 or higher)
Apple IIe, IIc Diagnostic 1.0 (5.25")	Copyable - DOS 3.3 (COPYA)
Apple IIe, IIc, IIGS Diagnostic 1.0 (3.5")	Copyable - System Utilities (2.1.1 or higher)
Apple IIGS Diagnostic 1.0 (5.25")	Copyable - System Utilities (2.1.1 or higher)
Apple /// Diagnostic Diskette	Copyable - System Utilities
Apple /// Plus Dealer Diagnostic Diskette	Copyable - System Utilities
MacTest 7.0	Copyable - See Section 2 of the **Macintosh Technical Procedures**

Macintosh Hard Disk Drive Diagnostic	Copyable - Macintosh Finder
ProFile Limited Data Recovery Program 2.0	Copyable - DOS 3.3 (COPYA)
Drive Acceptance Program	Copyable - DOS 3.3 (COPYA)
Digital Diagnostic Diskette (Dysan)	Not copyable
Disk Calibration Diskette (or Disk Alignment Aid)	Not copyable
Disk Alignment Diskette	Not copyable
AppleTalk NetCheck 2.0	Copyable - Macintosh Finder
LisaTest 1.0	Copyable - Option for making backup is on the diskette
Lisa 2 / Macintosh XL Diagnostic 3.0	Not copyable

For more information, turn to the Diagnostic section for the product in the appropriate **Technical Procedures** manual.

You Oughta Know Technical Procedures

Section 3

Keyswitch Replacement

Contents:

Keyswitch Replacement for Apple II, IIe, ///, and Macintosh.....3.2
Changing a Keyswitch: Screw Fastened Switches.....3.2
Changing a Keyswitch: Snap On Keys.....3.4
Keyswitch Replacement for Apple IIc.....3.7
Keyswitch Replacement for Apple DeskTop Bus Keyboards....3.9

NOTE: Keyswitch identification and keyboard exchange information for the Apple II, IIe, ///, and Macintosh is given in Appendix A of the technical procedures for each product.

KEYSWITCH REPLACEMENT PROCEDURES FOR THE APPLE II, IIe, ///, AND MACINTOSH

Tools needed: Soldering iron (60 watt, 700 degrees)
Solder sucker
60/40 resin core solder
#1 Phillips screwdriver

Apple II's have keyboards with three different types of keyswitches: those that screw on, those that snap on, and those that cannot be replaced.

1. Screw-on switches are on keyboards that have both screws and traces on the underneath side of the board of the mechanical assembly.

2. Snap-on switches are on keyboards that have traces but no screws on the underneath side of the board of the mechanical assembly.

3. Keys that are not replaceable are on the newest keyboards which have screws but no traces on the underneath side of the board of the assembly. If any switch fails, you replace the entire mechanical assembly.

CHANGING A KEYSWITCH: SCREW FASTENED SWITCHES

Removing the Keyswitch

1. To determine which key you want to remove, look at Figure 1 and find the number corresponding to the desired key. Locate that number on the back of the keyboard.

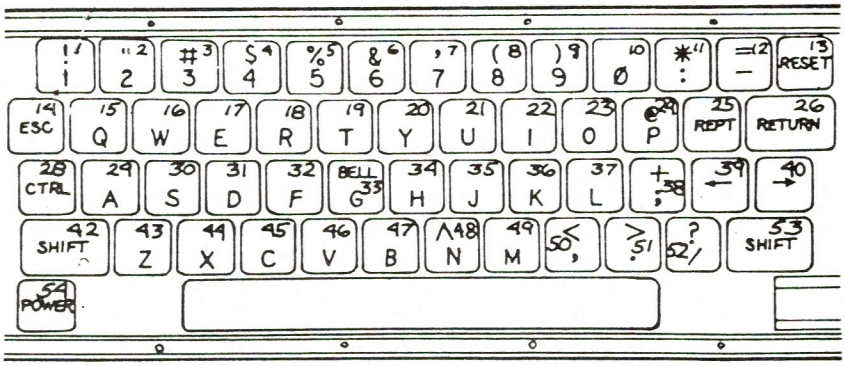


FIGURE 1

2. Prepare the solder sucker by pushing the plunger down as far as it will go.

3. Heat the soldering iron and make sure it is clean and well-tinned.

4. When the soldering iron is ready, put a small drop of fresh solder on each connection. this will facilitate melting and removal of the old solder.

5. Hold the soldering iron and the solder-sucker as shown in Figure 2. The tip of the iron should be firmly in contact with both the pin and the pad at the base of the pin.

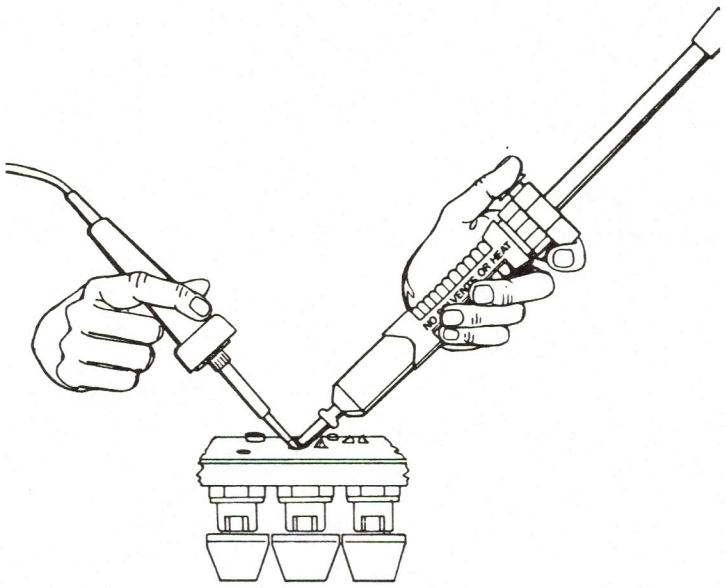


FIGURE 2

6. When the solder melts, quickly remove the iron, place the solder sucker vertically over the connection, and push the release button or lever to pick up the solder.

CAUTION: In the following steps, do not apply the soldering iron for more than three seconds. It may lift the traces off the board and destroy it.

7. Repeat this procedure for the second pin, being careful to observe the 3-second limit.

8. If any solder remains around the base of the pin, apply a little solder to the joint and repeat steps 5 & 6 to make sure all solder is removed.

9. Remove the screw holding the keyswitch to the board.

10. Turn the keyboard right-side up and pull up on the key cap to remove the switch assembly.

Installing the Switch

11. Insert the keyswitch into the board so that pins go through the holes.

12. Holding the key in place with one hand, turn the keyboard upside-down onto the pad.

13. Reinstall the screw that holds the key in place.

14. Apply a little solder to the iron. Then, with the tip in contact with both the pin and the pad that surrounds the pin hole, apply the new solder.

    CAUTION: In the following steps, do not overheat the board!

15. Check the joint to be sure that the solder has completely filled the hole around the pin and that the solder is built up in a little cone around the pin. If the joint is not filled, apply more solder.

CHANGING A KEYSWITCH: SNAP ON KEYS

Removing the Keyswitch

1. Locate the desired key. (See Figure 3.)

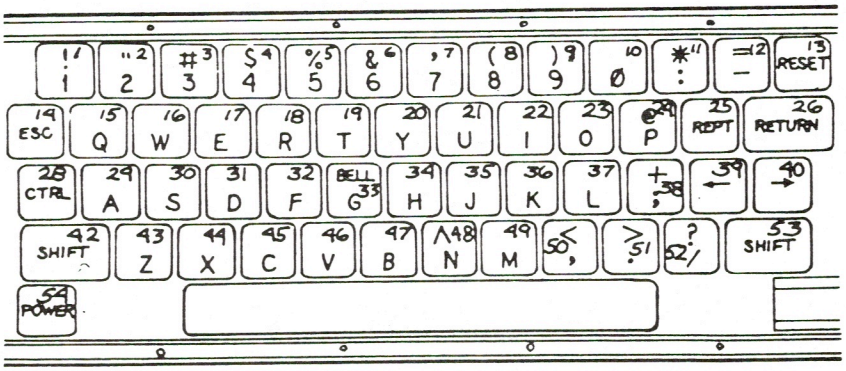


FIGURE 3

2. Put a little resin core solder on the joints.

3. Cock the solder sucker by pushing the plunger down as far as it will go.

4. Hold the soldering iron and the solder sucker as shown in Figure 4. The tip of the iron should be firmly in contact with both the pin and the pad at the base of the pin.

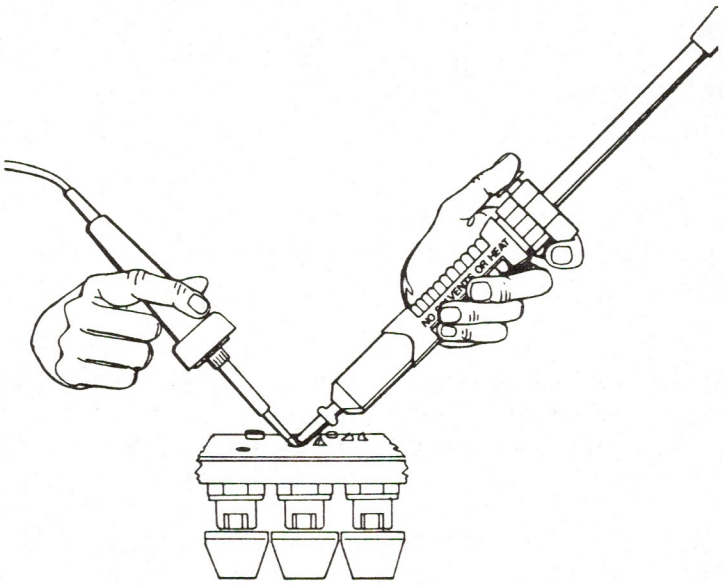


FIGURE 4

CAUTION: In the following steps, do not apply the soldering iron for more than three seconds. It may lift the traces off the board and destroy it.

5. When the solder melts, quickly remove the iron, place the solder sucker vertically over the connection, and push the release button or lever to pick up the solder. Make sure that all the solder is removed.

6. Repeat this procedure for the second pin. Be careful to observe the three second limit.

7. If any solder remains around the base of the pin, apply a little solder to the joint and repeat steps 4-6 to make sure all solder is removed.

8. Turn the keyboard over.

9. Take the key cap off.

10. With one pair of needlenose pliers, pinch the two clips on the keyswitch together.

11. With the other pair of needlenose pliers, remove the keyswitch.

Installing the Switch

12. Thread the pins of the keyswitch through the holes.

13. Snap the switch into place.

14. Replace the keycap.

CAUTION: In the following steps, Do not overheat the board!

15. Solder the pins into place. Apply a little solder to the soldering iron. With the tip in contact with both the pin and the pad that surrounds the pin hole, apply the new solder.

16. Check the joint to be sure that the solder is built up in little cone around the pin. If the joint is not filled, apply more solder.



FIGURE 5

KEYSWITCH REPLACEMENT FOR APPLE IIc

Tools Needed: Medium Phillips screwdriver
Small (jeweler's) flatblade screwdriver
Soldering iron
Solder sucker
Needlenose pliers
X-acto knife
60/40 resin core solder

NOTE: On the keyboards in some early systems, keycaps are bonded to their keyswitch. You will not be able to repair individual keyswitches on those keyboards. Send them back to Apple for repair.

Removing a Keyswitch

Some newer Apple IIc's have ALPS keyboards, which are slightly different from other IIc keyboards. Steps where these differences matter are marked with an asterisk (*).

1. Remove the keyboard from the IIc. (See **Apple IIc Technical Procedures.**)

2. Using Figure 5, locate the number of the keyswitch to be replaced. If the keyswitch solder pads are covered by the stabilizer bar (on the underside), remove the bar by squeezing the plastic prong (between the circuit board and the stabilizer bar at each end) with needlenose pliers.

3. Remove the keycap by gently lifting up with a screwdriver on one of the four sides.

*4. Remove as many of the surrounding keycaps as necessary until the plastic overlay can be peeled back from the edge far enough for the selected keyswitch to be removed without damaging the plastic.

   * There is no plastic overlay on the ALPS keyboard.

*5. Turn the keyboard over and locate the number of the keyswitch to be replaced. There are four connections for the keyswitch, two to the lower left of the number and two to the upper right of the number.

   * There are two connections for each ALPS keyswitch.

6. Apply fresh solder to each of the four keyswitch connections to be desoldered. This transfers heat through the connection faster, making it easier to desolder.

7. Desolder the keyswitch contacts. If any solder is left, use needlenose pliers and gently wiggle the keyswitch pins until the keyswitch can be easily removed.

*8. Peel the plastic overlay back and remove the keyswitch.

* There is no plastic overlay on the ALPS keyboard.

Installing a Keyswitch

*1. Look at the bottom of the keyswitch and notice the plastic leg on one corner.

* There is no plastic leg on the ALPS keyboard.

NOTE: There is only one way for the keyswitch to fit flush against the circuit board.

*2. Peel back the plastic overlay and position the pins and plastic leg of the keyswitch into their holes. Pop the keyswitch into position.

* There is no plastic overlay on the ALPS keyboard.

3. Turn the board over and check that the plastic leg is in its hole. Otherwise, the key will not fit flat nor work properly.

4. Lay the plastic cover back into position and replace the keycaps.

5. Solder the pins into place.

CAUTION: While heating both surfaces with the soldering iron, hold the solder against the point where the pin and the pad touch. The heat from the pin and the pad, not the soldering iron, should melt the solder.

6. Check the joint to be sure that the solder is built up in a little shiny cone around the pin. If the joint is not filled, apply more solder.

7. If the stabilizer bar was removed, replace it by inserting the plastic prong in the middle hole on each side of the board.

KEYSWITCH REPLACEMENT FOR APPLE DESKTOP BUS KEYBOARDS (ALPS KEYSWITCHES)

Tools Needed: Medium Phillips screwdriver
Small (jeweler's) flatblade screwdriver
Soldering iron
Solder sucker
Needlenose pliers
Exacto knife
60/40 resin core solder

Removing a Keyswitch

1. Remove the keyboard from the case. (See the technical procedures for the specific keyboard.)

2. Remove the keycap by gently lifting up with a screwdriver on one of the four sides.

3. Turn the keyboard over. Using the keyswitch map (Figure 6), locate the number of the keyswitch to be replaced. There are two connections for each keyswitch.

4. Apply fresh solder to each of the two keyswitch connections to be desoldered. (Adding the fresh solder creates a mixture that transfers heat through the connection faster, making it easier to desolder.)

5. Use the solder sucker to desolder the keyswitch contacts. If any solder is left, use needlenose pliers and gently wiggle the keyswitch pins until the keyswitch can be easily removed.

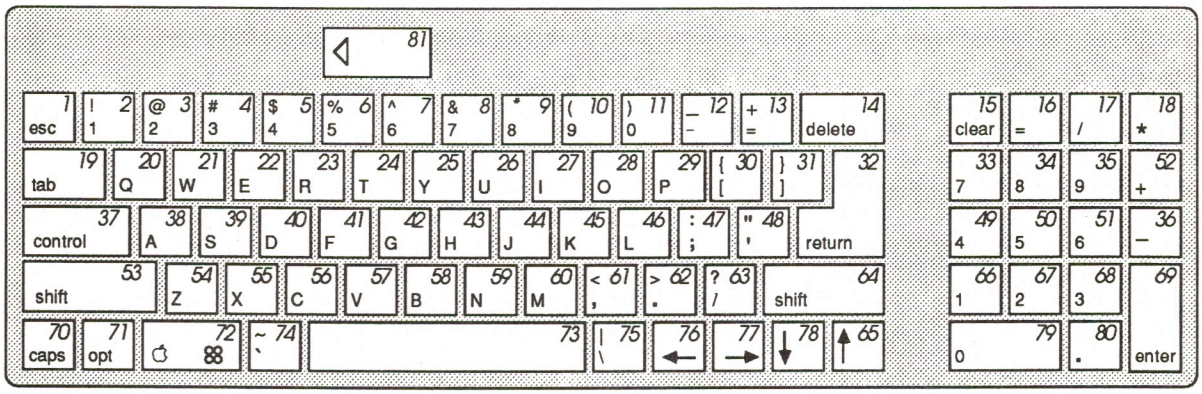


FIGURE 6

Installing a Keyswitch

1. Position the pins of the keyswitch into the appropriate holes on the keyboard and press in.

2. Solder the pins into place.

   CAUTION: While heating both surfaces with the soldering iron, hold the solder against the point where the pin and the pad touch. The heat from the pin and the pad, not the soldering iron, should melt the solder.

3. Check the joint to be sure that the solder is built up in a little shiny cone around the pin. If the joint is not filled, apply more solder.

4. Replace the keycap.

5. Replace the keyboard into the case. (See the technical procedures for the specific keyboard.)

You Oughta Know Technical Procedures

Section 4

Simplified Overview of a Microcomputer System

Contents:

Introduction.....4.2
What Language Does It Speak?.....4.2
Components and Functions of a Microcomputer System.....4.3
Flow of Information in a Microcomputer System.....4.6
Glossary: Some Common Terms.....4.8

INTRODUCTION

This section presents a simplified overview of how any microcomputer system works. It includes definitions of the basic components of any system (e.g., CPU, ROM, RAM) and descriptions of their functions. It also describes the flow of information through any microcomputer.

More specific information on Apple's various microcomputers and their modules can be found in the troubleshooting sections for the individual products.

WHAT LANGUAGE DOES IT SPEAK?

No matter what operating systems or high-level languages a computer uses, its basic language is binary numbers (0's and 1's). The binary (or "base 2") number system uses only two symbols, 0 and 1. By combining series of 0's and 1's, microcomputers can represent any desired numbers, letters, special characters, and codes.

The two symbols, 0 and 1, are called binary digits or **bits.** The electronic components and circuits used in microcomputers must be capable of assuming two states or values corresponding to 0 and 1. For example, when a switch is on (closed) it can represent a binary 1. When the switch is off (open) it can represent a 0. The 0 and 1 can also be represented by different voltage levels.

In all microcomputers, the basic unit of information (word) contains a fixed number of bits, and the length of a word in a given computer depends on the hardware design of the computer. Microprocessors are available that use 4-, 8-, 12-, 16-, and 32-bit words. The most common binary word length is 8 bits. In microcomputer jargon, an 8-bit word is called a **byte.** A 4-bit word is called a **nibble.** The memory of the microcomputer stores the data or instructions in binary code, 0's and 1's.

COMPONENTS AND FUNCTIONS OF A MICROCOMPUTER SYSTEM

CPU

The CPU or Central Processing Unit combines system control, arithmetic, and logic functions on a single chip. CPUs are sometimes called microprocessing units or MPUs.

The Control Unit of the CPU sequentially looks at and interprets instructions given in a program and issues "orders" to the other components of the microcomputer to carry them out.

The Arithmetic/Logic Unit (ALU) is the part of the CPU where the actual processing of the data takes place. For example, if a "logical and" instruction is stored in memory, and the program calls for it, the control component will get the instruction, interpret it, and send orders to the ALU to perform it.

Buses

Transfers of data in a microcomputer take place in "parallel," which simply means that all bits are moved from the memory to the CPU at the same time. The movement of data takes place along circuits called Buses. Microcomputers have three major buses: a data bus, an address bus, and a control bus.

The Data Bus sends data to and from the CPU, Memory, and Input/Output components.

The Address Bus carries signals that activate the particular areas of the system that the CPU needs to contact. Together with the Control Bus, it drives all of the Memory and Input/Output devices.

The Control Bus carries signals from the CPU that initiate and time the various memory accesses and input/output operations.

Memory

The Memory stores data and instructions which the microcomputer uses. The two types of memory widely used are RAM and ROM.

RAM (Random Access Memory) gets its name from the fact that any location may be accessed at any time. Programs and information are stored here, but only temporarily. The information is erased when the microcomputer is turned off. Once a memory location is enabled (addressed by the CPU), data may be written into or read from that location. The address of the location is usually supplied by the CPU. The data stored in the enabled location comes from or goes to the CPU.

ROM (Read Only Memory) contains permanently stored data and instructions. The data or instructions stored in ROM can only be retrieved, not changed; data cannot be written to ROM. When the power is turned off, the information in ROM remains intact. Frequently used instructions are usually stored in ROM rather than on a disk. This allows faster and more convenient access to commonly used instructions. For example, when you turn a system on, the CPU accesses the ROM for instructions on how to start up.

Input/Output

Input/Output operations connect the microcomputer to external ("peripheral") devices. The most common I/O operations allow the microcomputer to communicate with a human operator through input devices such as the keyboard and mouse and output devices like the monitor and printer. Disk drives, modems, and similar devices are used for both input and output.

I/O operations take place through a special component of the microcomputer, usually referred to as an interface. This component may also be referred to as an I/O port. The interface is connected to the CPU via the three buses (data, address and control).

Input/Output (continued)

There are two widely used forms of input/output: parallel and serial.

In parallel data transmissions, all bits of the binary word are sent to the output device simultaneously. This means there must be one path (circuit) for each bit of data which is being sent (see Figure 1 below).

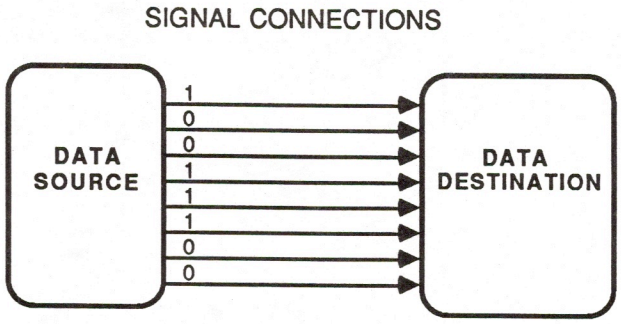


FIGURE 1

In serial data transmission, the binary data is sent one bit at a time. Serial data transmission is the most widely used method of communication between microcomputers and peripherals. In Serial communications, each bit is transmitted for a fixed time interval. This bit time is referred to as baud rate (or bits per second). Baud rates vary widely in microcomputer and data-communication systems. Popular rates are 300, 1200 and 9600 (see Figure 2 below).

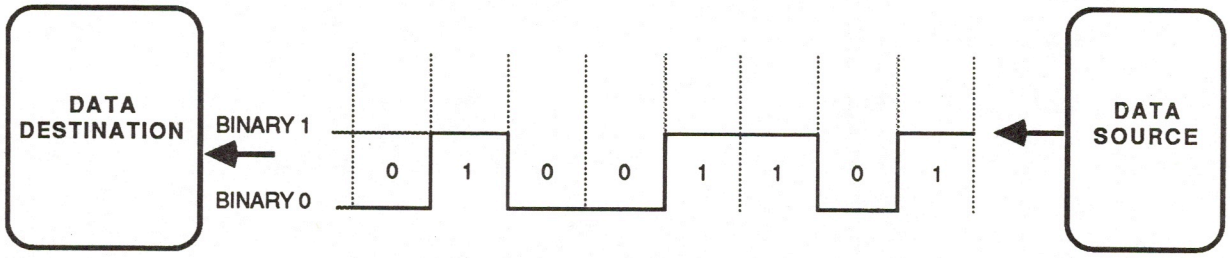


FIGURE 2

FLOW OF INFORMATION IN A MICROCOMPUTER SYSTEM

The diagram below (Figure 3), with its numbered arrows, shows how information flows through a microcomputer system. The numbered steps beneath the diagram correspond to the numbered arrows.

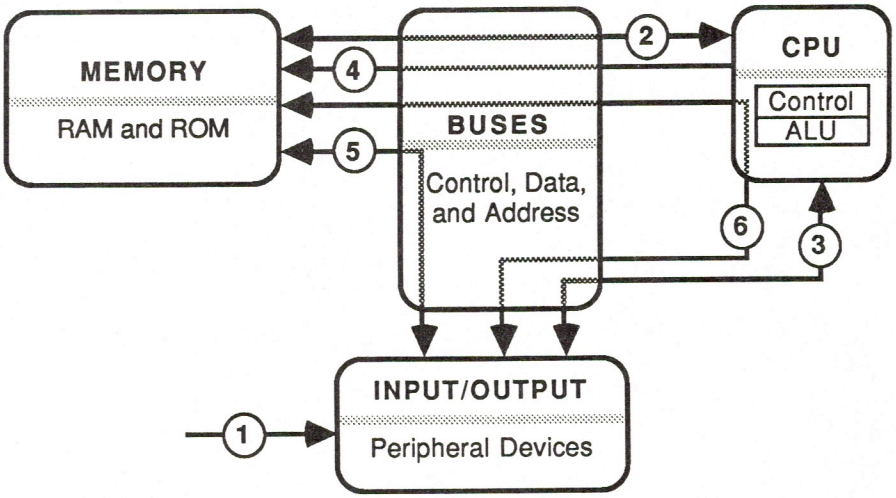


FIGURE 3

1. A diskette is inserted into a disk drive (I/O device) and the microcomputer is turned on.

2. The CPU reads instructions on what to do from ROM (Read Only Memory).

3. The CPU checks for a disk (I/O device). The disk can be either a hard disk or a diskette. If a disk is present, the CPU looks there for an operating system. The microprocessor needs the operating system to know how to handle the flow of information between the hard disk or diskette and RAM (Random Access Memory).

4. After locating the operating system, the CPU puts a copy of it into a specified location in RAM.

5. A copy of whatever program (application or language) is on hard disk or diskette is put into RAM. RAM now contains the operating system and the program.

6. At this point, the user may enter data from the keyboard (I/O device). The data is processed in the CPU and sent to RAM for temporary storage. Information stored in RAM should be periodically saved to hard disk or diskette. The instruction or command to save is sent from the keyboard to the CPU. The CPU sends the appropriate instructions to RAM. The RAM then sends the information to the CPU, where it is routed to the hard disk or diskette for permanent storage.

   When your data is safely saved on hard disk or diskette for future use, the microcomputer may be turned off.

Summary

The CPU is the nerve center of the system. It performs all the central control functions. All arithmetical, logical, and operational decisions are made here. The CPU gets instructions from memory, decodes them, and issues the instructions to the appropriate components.

The Memory component stores instructions and data. The instructions are stored in sequence in binary code, so that the microcomputer knows what to do. While it is performing an operation, the CPU needs data to use or to manipulate. This data is usually brought in through an I/O device. After the operation on the data is completed in the CPU, the new data is sent to memory to be stored.

The Input/Output component, as its name implies, passes information back and forth between external devices and the microcomputer.

The buses carry the data (which is in binary code) between the components. The three buses are Data, Control, and Address.

GLOSSARY: SOME COMMON TERMS

Applesoft editor - A routine (short program) stored in ROM in the Apple II family of computers. The Editor allows you to type and correct programs in the Applesoft BASIC language.

Applesoft interpreter - A routine stored in ROM in the Apple II family of computers. The Interpreter translates the instructions in an Applesoft BASIC program into machine language, so that the computer can perform them.

clock or (oscillator) - The basic source of synchronizing signals in a microcomputer. The clock produces an alternating signal with a stable frequency. The clock's **pulses** (or cycles) are used to synchronize all events in the computer.

clock pulse - One cycle of the alternating signal produced by the clock.

keyboard and keyboard encoder - When a key is pressed, the keyboard sends seven bits of information to the keyboard encoder. The keyboard encoder transforms this information into a signal that the computer can interpret.

Monitor - A program stored in ROM which acts as a supervisor for the computer. The Monitor program controls all programs, and all programs use it.

peripheral - A device which is attached to the computer, but is not part of the computer. Most peripherals are input/output devices. Examples: printer, disk drive, keyboard, video monitor, etc.

power supply - The power supply converts the AC line voltage into a DC voltage.

timing - The interval between the rise and fall of any signal in the microcomputer.

You Oughta Know Technical Procedures

Section 5

Dot Matrix Technology

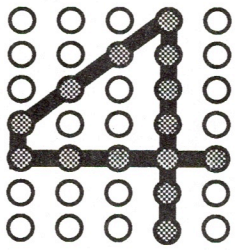
Contents:

Introduction.....5.1
What is Matrix Printing?.....5.2
How Does it Print?.....5.2

INTRODUCTION

The most commonly used low-cost printing technology is dot matrix printing. The following section will tell you how dot matrix technology forms characters.

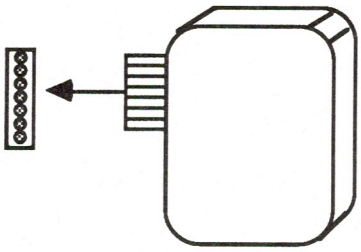
WHAT IS MATRIX PRINTING?



The dot matrix method of printing is both fast and effective. It gives the printer the capability of producing many different font styles, and graphics as well. The letters, however, are not fully formed; instead, they are made up of single dots that are combined to resemble letters, numbers, and various special characters.

The dots are arranged so that any character may be formed. The matrix pictured to the left is 5X7. Higher density dot patterns (7X7 and 9X12 matrices) permit more fully formed characters and higher-resolution graphics.

HOW DOES IT PRINT?



Dot matrix characters are printed by a special print head which is made up of a group of wires vertically positioned. A 5X7 matrix printer has seven closely spaced wires in the print head, as shown at the left. The end of each wire can independently strike the paper through the ribbon.

As the print head moves horizontally across the paper, one space increment at a time, characters are generated by properly controlling which print wires strike the paper. In a 5X7 matrix printer, each character consists of five columns, with anywhere from zero to seven dots in each column.

The Dot Matrix Printer, the ImageWriter and the ImageWriter II all use this method of printing. Refer to **ImageWriter** or **ImageWriter II Troubleshooting** for a diagram and description of the flow of information through each printer.

Apple Technical Procedures

You Oughta Know...

Section 6 – Electrostatic Discharge (ESD)

❑ CONTENTS

6.2 Introduction
6.3 ESD Prevention Rules
6.4 Setting Up an ESD-Safe Workstation

❑ INTRODUCTION

Static (or "stationary") electricity is, simply, electricity that is not moving. And it is harmless as long as it remains static. Unfortunately, an electrical charge is unstable and is always looking for an opposite charge to unite with. When a charge moves, it becomes a *current*—often a greater current than a microcircuit can handle.

You may already know that touching a chip lightly with your fingertip can degrade a circuit so that it never again performs to specifications. But did you know that brushing certain kinds of clothes (like your polyester shirt) over a printed circuit board can do the same thing? In fact, unprotected electronic devices can be "zapped" just by waving a charged object nearby.

The smallest charge you can feel is 3,000 volts; the smallest charge you can see is 5,000 volts; and the smallest charge you can hear is 10,000 volts. **But some of the newest semiconductor devices are susceptible to as little as 10 volts, or one three-hundredths as much as you can feel.**

Electrostatic discharge (ESD) has therefore become more and more of a hazard as microcircuits have become smaller and more sensitive.

This section contains rules for preventing ESD damage to equipment you are working on. It also contains instructions on setting up an ESD-safe workstation. **These rules and instructions hold true whether you are working at your shop or at a customer's site.**

❑ ESD PREVENTION RULES

Here are the rules you need to learn and follow to prevent ESD damage. We have included a key word above each rule as a memory aid:

Grounds

Before working on any device containing a printed circuit, ground yourself and your equipment to an earth or building ground.

Use a grounded conductive workbench mat and a grounding wriststrap, and ground your equipment to the mat.

WARNING: *Make sure you are* ***not*** *grounded when :*

- *You work on plugged-in equipment*
- *You discharge a Cathode Ray Tube (CRT)*
- *You work on an unplugged CRT that has not yet been discharged*

Bodies

Don't touch anybody who is working on integrated circuits.

If that person is properly grounded, your "zap" may not cause any damage, but just to be on the safe side, do not touch or brush against other technicians.

Bags

Use static-shielding bags for boards and chips during storage, transportation, and handling.

When you are ready to leave your bench and take a board to a storage place, first put the board in a static-shielding bag. Leave all Apple service exchange components in their ESD-safe packaging until you need them.

Leads

Handle all ICs by the body, not the leads.

Also, do not touch edge connectors on boards or cards, exposed circuitry, or printed circuits. Handle ICs, boards, and cards by the edges, or use extractors.

Synthetics

Do not wear polyester clothing or bring plastic, vinyl, or styrofoam into the work environment.

The electrostatic field around these nonconductors cannot be removed.

Metals

Never place components on any metal surface.

Use antistatic, conductive, or foam rubber mats.

Atmosphere

If possible, keep the humidity in the service area between 70% and 90%, and use an ion generator.

Charge levels are reduced (but not eliminated) in high-humidity environments and in areas where an ion generator is used routinely.

❑ SETTING UP AN ESD-SAFE WORKSTATION

Materials Required

Conductive workbench mat, with ground cord
Wriststrap, with 1 megohm resistor and ground cord
Equipment ground cord, with alligator clips
Ground/polarity tester

Setup and Procedure

After you gather the materials above, **remove all ESD hazards from the area**:

- Styrofoam
- Common plastics
- Synthetic clothing
- Vinyl

These nonconductive materials cannot be grounded and will retain a charge for hours and even days. Since the static field surrounding them can easily damage sensitive components, it's best to keep these materials completely out of your work area.

After you remove the ESD hazards, proceed as follows:

1. **Use a ground/polarity tester to verify proper grounding of the power outlet.**

   Ground/polarity testers vary slightly in design, but all are very simple to use. Insert the three prongs

of the tester into the three-prong outlet. If the outlet is wired incorrectly, most testers show a light pattern that matches a code given on the tester.

If the tester does not verify proper grounding, move to another outlet that is safe—whether you are at the customer's site or at your shop.

2. **Connect the ground cord of the workbench mat to ground.**

3. **Use a wriststrap ground cord. Fasten it to the workbench mat and to the wriststrap.** The wriststrap should touch your skin.

   All objects in the service area should be grounded to the same potential. Touching the chassis of a machine will bring you to the same potential as the machine, which is better than nothing. However, since just the act of shifting your weight from one foot to the other can generate static, momentary "touch" grounding is not enough. That is why you need the continuous grounding provided by a grounded wriststrap.

4. **Finally, ground the equipment you are working on.**

   Use alligator clips and a grounding cord to attach any metal part of the device you are working on to the grounded workbench mat.

   If you are working on a product that has a three-prong power cord, you can attach the ground pin of the power cord to the workbench mat using your alligator clips and ground cord. (Of course, the unit will not be plugged into the wall outlet.)

WARNING: *When you discharge a CRT or work with a powered-on CRT, do not wear a wriststrap, and do not work on a grounded pad.*

Multi-Product Diagnostics

MULTI-PRODUCT DIAGNOSTICS
TECHNICAL PROCEDURES

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Multi-Product Diagnostics
Technical Procedures

Section 1

Apple II Peripherals Diskette

Contents:

Introduction.....1.2
Monitor Tests.....1.3
Printer Tests.....1.5

INTRODUCTION

The Apple II Peripherals Diskette contains a series of functional tests for the Apple II monitors and printers and a diagnostic test for the Apple II Memory Expansion Card.

The tests may be run on any of the following computers: Apple II, II Plus, IIe, and IIc. You may also run the tests on the Apple /// if you boot the Apple II Emulation program first.

Exceptions:

1. The Memory Expansion Card test cannot be run on the ///.

2. The Dot Matrix Printer test cannot be run on the IIc.

3. The Silentype test cannot be run on the IIc or ///.

This section contains instructions for running the monitor and printer tests of the Peripherals Diskette. Instructions for the use of the Memory Expansion Card test are found in the Memory Expansion Card section of the **Apple IIe Technical Procedures.**

Use of the Peripherals Diskette is very simple. For the functional tests, the user observes the results of the test (the output on the screen or printer paper) and decides for himself if the device is functioning properly. For specific information on an acceptable level of functioning for the device (and its repair or adjustment) see the appropriate Technical Procedures.

Materials Needed

Apple II Peripherals Diskette
Apple II, II Plus, IIe, or IIc computer
  (or Apple /// with Apple II Emulation Diskette)
Monitor
Printer to be tested (optional):
   Imagewriter
   15-inch Imagewriter
   ImageWriter II
   Daisy Wheel Printer (with Courier 10 print wheel)
   Dot Matrix Printer
   Scribe
   Silentype

Main Menu

Set up the selected computer, monitor, and printer (optional). Insert the Apple II Peripherals Diskette into the computer's disk drive and turn on the computer and the peripheral(s). The main menu will appear:

1. **Monitors**

2. **Printers**

3. **Apple II Memory Expansion Card**

Type the number of the test classification you want. If you press <ESC> you will exit the program.

MONITOR TESTS

When you select the monitor tests from the main menu, six test pattern options (plus "Test All") will appear. Type the number of the test pattern you wish to view. If you are a first-time user of the diskette, it is handy to use "Test All" first so that you can view all the test pattern options. Each pattern will remain on the screen until you do one of the following:

Press the spacebar (for "Accept," or "Pass")

Type X (for "Reject," or "Fail")

Press <ESC> (to return to the monitor menu)

NOTE: On individual tests, you are returned to the monitor menu after you indicate a "Pass" or "Fail." (If you selected "Test All," the next test pattern will be displayed automatically.)

The results of the testing are indicated on the monitor menu.

The judging of test results is purely subjective.

The Pass/Fail selection is provided so that you may keep track of the results of each test as you go along.

The Monitor Test options are as follows:

0. Test All - Displays all six monitor tests in sequence below.

1. Dot Pattern - Shows a 20x28 column dot pattern crossed by two diagonal lines (corner to corner).

   This test can be used to indicate whether yoke and ring alignment are correct.

2. Grid Pattern - Shows a grid of 11 vertical lines intersected by 11 horizontal lines.

   This test can be used to indicate correct yoke and ring alignment.

3. 40-Column Display - Shows text display of 23 lines of 40 characters each.

   This test can be used to test character generation and vertical and horizontal size.

4. 80-Column Display - Shows text display of 23 lines of 80 characters each.

   This test can also be used to test character generation and vertical and horizontal size. **This test will run ONLY if there is an 80-column card installed, and will NOT run on the Apple II Plus.**

5. Color Bars - Shows vertical color bars with the name of each color below.

   This test can be used to adjust the color of color monitors.

6. Full White Screen - Shows a full white screen.

   This test can be used to check for white balance (a color monitor adjustment).

PRINTER TESTS

Before you begin, make sure the printer you wish to test is properly configured for the computer you are using (that is, make sure the dip switch settings are the same for both the interface card and the printer). **If you are using a IIe or II Plus, note the slot in which the interface card is installed.**

NOTE: If you are using an Apple ///, you must first boot the Apple II Emulation program, press <ESCAPE> to go into "Options," and set the baud rate to match the printer dip switch settings. Then insert the Peripherals Diskette and press <RETURN> to boot. (If you are using the Dot Matrix Printer with the Apple ///, you must first install a UPIC card in slot 2 of the Apple ///, with the switch on the card set to "AUTO." Then, when you boot the Emulation program, go into Options and set "Line Width" to 80. Then insert the Peripherals Diskette and press <RETURN> to boot.)

When you select the printer tests from the main menu, seven Apple II compatible printers are listed for you to choose from:

1. Imagewriter
2. 15-inch Imagewriter
3. ImageWriter II
4. Dot Matrix Printer
5. Daisy Wheel Printer
6. Scribe
7. Silentype

Enter the number of the printer you wish to test:

Apple IIc - You will be prompted to enter the slot number. Enter slot "1" and be sure the printer is set at 9600 baud.

Apple /// - With all serial printers, slot 5 (RS-232 port) will automatically be assigned and the selected printer menu will appear. As noted above, when you are using the Apple /// to test the Dot Matrix Printer (parallel), the UPIC card must be installed in slot 2 and the switch on the card set to "AUTO." Slot 2 will then automatically be assigned. You need only press <RETURN>.

Apple II Plus or IIe - You will be prompted to enter the slot number where the interface is installed. If you select the wrong slot number (without pressing <RETURN>), press <ESC> and start over. If you type in the wrong slot number and press <RETURN>, you must reboot by turning the computer off and on (or wait while the program finishes the test sequence).

When the printer's menu screen appears, it will list the tests available for that printer. (The table at the end of this section shows the tests available for each printer.)

Enter the number of the test you want. The name of the test selected will head the printout, followed by the pattern of characters the test displays. (**NOTE:** When testing a printer with an Apple /// under Emulation mode, the printer carriage may bounce to the extreme right before beginning the test printout. Ignore this reaction.)

The character set test and custom characters test run continuously until you do one of the following:

Press the spacebar	(for "Accept," or "Pass")
Type X	(for "Reject," or "Fail")
Press <ESC>	(to return to the printer menu)

The remaining tests print a number of lines (usually five) as a sample, then give you the additional option below:

Press <RETURN>	(to repeat test)

NOTE: After you indicate a "Pass" or "Fail" the printer menu returns automatically.

The results (Pass, Fail) you give the printer for each test are indicated on the printer menu.

The Functional Test prints each available test in sequence (about five lines of each). The test can be aborted at any time after starting by pressing <ESC>. The test sequence will stop and you will be returned to the selected printer's menu. This feature allows you to stop the test sequence in case of paper jams, etc.

The Printer Test options are as follows:

Functional Test - Performs a prescribed number of iterations (usually five) of each test available for the printer being tested.

Character Set - Continuously prints the full set of characters, with underlining.

This test is used to check character generation.

Alternate Sets - Prints one each of all alternate character sets available.

This test checks the printer's interpretation of the logic board commands for alternate character sets.

Custom Characters - Continuously prints any customer-designed characters.

This test checks the circuitry used for downloading a custom character and the ability of the printer to print the character when called.

Graphic Images - Prints 5 horizontal lines - very narrow to very wide. (On the DWP, this test prints text and overcast X's in graphic mode. On the Silentype, this test produces a picture.)

This test checks the ability of the printer to interpret graphic commands sent to it.

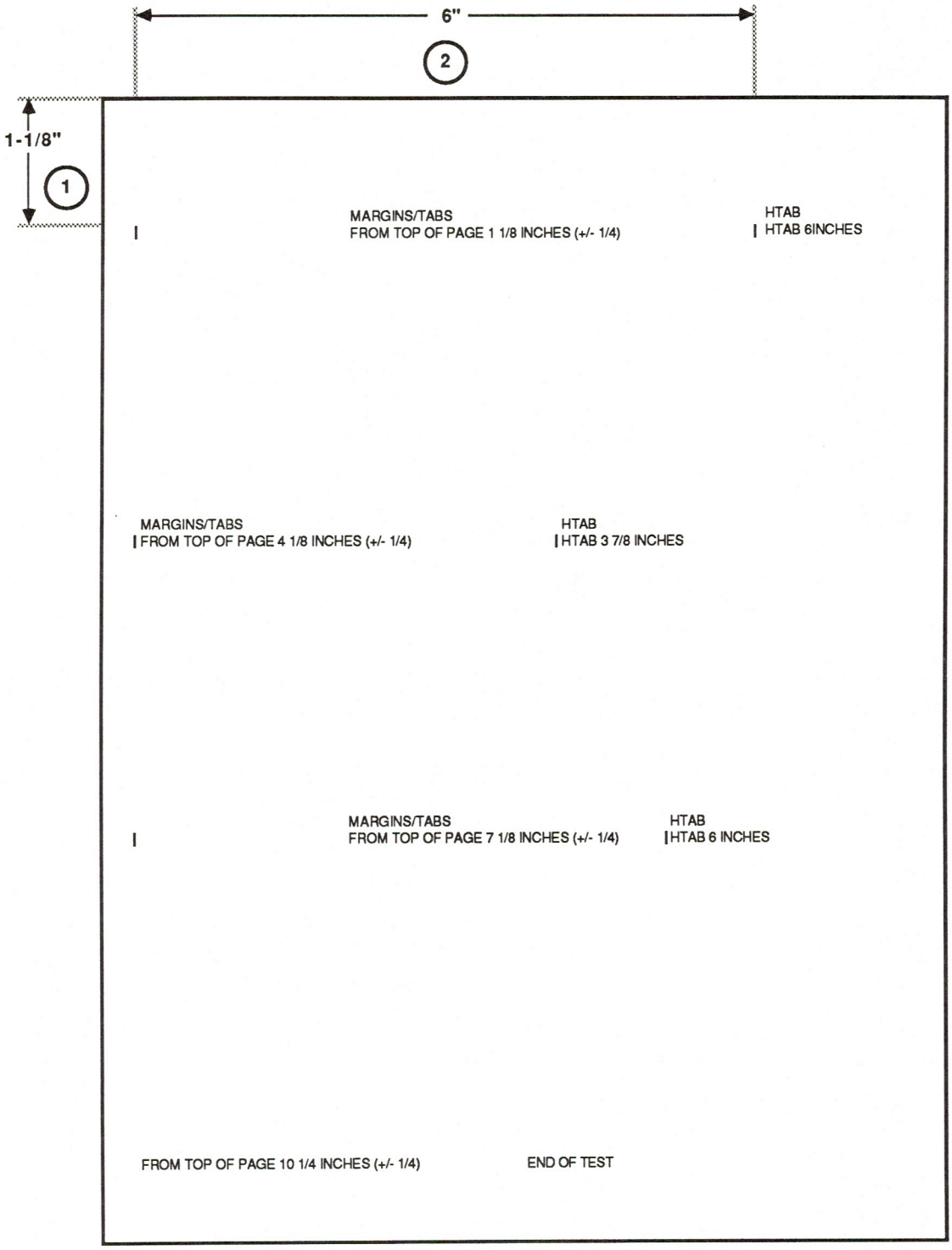

6"
2
1-1/8"
1
MARGINS/TABS
FROM TOP OF PAGE 1 1/8 INCHES (+/- 1/4)
HTAB
HTAB 6INCHES
MARGINS/TABS
FROM TOP OF PAGE 4 1/8 INCHES (+/- 1/4)
HTAB
HTAB 3 7/8 INCHES
MARGINS/TABS
FROM TOP OF PAGE 7 1/8 INCHES (+/- 1/4)
HTAB
HTAB 6 INCHES
FROM TOP OF PAGE 10 1/4 INCHES (+/- 1/4)
END OF TEST

FIGURE 1

Margin/Tabs - Prints lines and tabs with measurements given for verification, as in the example at left (Figure 1), which shows the test printout from ImageWriter II.

Before the test begins, you are given a chance to align paper in the printer. Press <RETURN> when you are ready to begin.

If paper is aligned in the printer correctly, the distance from the top of the page to the interspace between the first two printed lines (Figure 1, #1) and the distance between tab lines (Figure 1, #2) should be as indicated on the printout, give or take the acceptable variance. **The measurements given will vary from printer to printer.**

Registration - Prints rows of underlined bar lines (||||||||||||||||). On the Silentype, the test prints rows of H's (HHHHHHHHHHHHHHHH).

This test allows you to check the vertical and horizontal alignment (firing hammer adjustment). Run this test several times before making any repairs on the printer.

Color Test - (ImageWriter II and Scribe only)

ImageWriter II - Prints five lines each of the full character set in the following colors: yellow, purple, red, green, blue, orange, and black.

Scribe - Prints five lines each of the full character set in three colors: yellow, blue, and red.

This test allows you to test the printer's interpretation of the color commands from the computer's logic board and to test the mechanical operation of the color ribbon and the adjustment of the color cam.

Print Intensity - (Silentype only)

Prints one line of each intensity setting from 0 to 7.

This test checks the printer's mechanical components and the interpretation of the intensity settings.

Mouse Text - (ImageWriter II only)

Prints five lines of mouse text characters.

This test checks printer's ability to interpret and print mouse text characters when called.

Table of Printer Tests

Name of Test	IW	IW-15"	IW-II	DMP	DWP	Scribe	Silent
Functional Test	x	x[1]	x	x	x[2]	x	x
Character Set	x	x	x	x	x	x	x
Alternate Sets	x	x	x	x	x	x	
Custom Characters	x	x	x	x			
Graphic Images	x	x	x	x	x[3]	x	x[4]
Margin/Tabs	x	x	x	x	x	x	
Registration	x	x	x	x	x	x	x
Color Test			x			x[5]	
Print Intensity							x
Mouse Text			x				

NOTES

1. The tests of the 15-inch ImageWriter print to 15 inches.
2. Use a Courier 10-pitch daisywheel for the DWP tests.
3. On the Daisy Wheel Printer, the Graphic Image is composed of text and a line of overcast X's done in graphics mode.
4. On the Silentype, the Graphic Image is a picture.
5. On the Scribe, you will be prompted to insert the color ribbon just before the color test, and instructed to remove it and replace the black ribbon after the color test is completed.

Disk Drives

Apple Technical Procedures

Disk Drives

Technical Procedures

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Section 2 – Drive Compatibility

2.2 Compatibility of 3.5-inch (800K) Drive Mechanisms

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Disk Drives

Section 1 – 5.25-Inch Drive Diagnostic

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1.18 What to Do If a Test Fails
1.19 Failed Test/Corrective Action Chart

❑ INTRODUCTION

The *Apple 5.25-Inch Drive Diagnostic* program, hereafter called the diagnostic, checks all the major functions on Apple 5.25-inch disk drives, including:

- Write protect
- Diskette clamping
- Head radial alignment
- Drive motor speed
- Track seeking
- Read and write verification
- Hysteresis

Each diskette contains both the diagnostic program and the drive test patterns. You can make disk drive speed adjustments, test several drive specifications, and perform functional tests without changing diskettes.

Because of these features, the diskette is **not copyable**. You should therefore always have two copies of the diskette. (When one diskette needs replacing, you may exchange it through the Media Exchange Program.) The diagnostic program keeps a record of the number of times the diagnostic diskette has been used and will alert you to replace the diskette when you are approaching the maximum number of uses and again when you reach the maximum.

The diagnostic supports all members of the Apple II and Apple III family of computers and all associated 5.25-inch disk drives. These include:

- Apple II, II Plus, IIe, and IIGS
- Apple IIc
- Apple III and III Plus

- Disk II
- Disk III
- UniDisk/Apple 5.25 Drive
- DuoDisk
- Disk IIc

If your drive fails during a diagnostic test, try using another diagnostic diskette (see "Materials Required").

If the program indicates a failure again, refer to the "What to Do if a Test Fails" section, and perform the steps for the test that failed. After following the necessary course of action, rerun the entire diagnostic.

Helpful Hint

When you test many disk drives at the same time, configure the diagnostic and save the configuration. Then test all your disk drives of the same type together. This way you won't need to reconfigure the diagnostic every time you power up the system for each disk drive.

IMPORTANT: *Before using the diagnostic diskette, remove it from its shipping package and leave it (in its protective envelope) on your workbench for 24 hours. This allows the diskette to adjust to the temperature and humidity of the room. If this precaution is not taken, the diagnostic can give incorrect and unpredictable results.*

❑ THINGS TO REMEMBER

Operating the Diagnostic

1. If a menu selection is highlighted, pressing <Return> selects the option. Pressing the <Up Arrow> skips to the option above; pressing the <Down Arrow> skips to the option below. An option may be selected directly by pressing the number of the option, then <Return>.

2. Where input is required to continue to the next test (when **Pause After Tests** is selected, for example), press <Space>.

3. Use <Escape> to abort the test in progress and return to the main menu.

4. When running the diagnostic on the Apple IIGS, **do not** attempt to enter the control panel while a test is running. Doing so may cause the diagnostic to produce unreliable results.

Handling the Diagnostic Diskette

1. Insert the diskette into the drive **carefully** and close the drive door **gently**.

2. Leave the drive door **closed** while the diagnostic is reading or writing to the diskette. This is especially important during the DSPEED and write and verify tests. **Failure to do so will cause damage to the recorded test and program areas.**

3. Return to the main menu before removing diskettes except when testing the write-protect switch.

4 Before each use, inspect the inner diskette ring for physical damage such as indentations, tears, or warping. **Damaged diskettes may cause incorrect test results and may even fail good drives.** Be sure to replace damaged diskettes—even if they still boot successfully. For replacement, return damaged diskettes to Apple through the Media Exchange Program.

❑ THE TESTS—WHAT THEY DO

Write Protect

Checks the function of the disk drive's write-protect switch. In other words, the test verifies that the drive won't write on write-protected diskettes, and will write on unprotected ones.

Clamping

Verifies that the diskette is seated properly on the spindle when it is installed in the drive with the door closed. Also, the clamping mechanism is checked to make sure it is adjusted properly.

Radial Alignment

Verifies that the head moves to the center of each track. If a drive is having trouble booting, or having compatibility problems with other drives (one has trouble reading what the other writes, for example), the drive may be out of alignment.

DSPEED

Checks the speed at which the diskette is spinning. If a drive will not boot diskettes or gives many I/O error messages or produces diskettes that other drives cannot read, it may be spinning too fast or too slowly.

Read and Seek

Tests the disk drive read circuitry. Also, the test "exercises" the drive by performing the random head movement the drive would be subjected to in actual use.

Write and Verify

Performs a write and a read of the diskette and compares the two values.

Hysteresis

This test moves the read/write head to Track 0 (to recalibrate), then to Track 16, to Track 34, and finally back to Track 16. It then verifies that the read/write head is truly at Track 16 and has not "drifted" during the head movement process.

❑ MATERIALS REQUIRED

Apple 5.25-Inch Drive Diagnostic program diskette

Note: This diskette cannot be copied.

Known-good Apple II, II Plus, IIe, IIGS, or IIc; or Apple III or III Plus

Note: The Apple III or III Plus is used in Apple II emulation mode.

Known-good disk controller card for the drive being tested (if using an Apple II, II Plus, or IIe)

Disk drive to be tested

Known-good disk drive

Apple II Emulation Disk (if using an Apple III or III Plus)

Optionally, a printer, cable, and if using an Apple II, II Plus, or IIe, an interface card (for printing a test result summary)

❑ SETUP

Prior to using the diagnostic, you must set up (or configure) the program for the particular system you are using. Follow the appropriate directions below.

Selecting Menu Items

If a menu selection is highlighted, pressing <Return> selects the option. Pressing the <Up Arrow> skips to the option above. Pressing the <Down Arrow> skips to the option below. Also, an option may be selected directly by pressing the number of the option, then <Return>.

Unbootable Drives

The diagnostic diskette must be in the disk drive to be tested. If you are testing a drive that won't boot or you suspect may not be functioning correctly, connect it to the system as drive 2 and boot the diagnostic from drive 1. After the diagnostic has finished booting, remove the diagnostic diskette from drive 1 and place it in drive 2.

IMPORTANT: *Before using the diagnostic diskette, remove it from its shipping package and leave it (in its protective envelope) on your workbench for 24 hours. This allows the diskette to adjust to the temperature and humidity of the room. If this precaution is not taken, the diagnostic can give incorrect and unpredictable results.*

Apple II, II Plus, IIe, or IIGS

1. Set up the computer, disk drives, monitor, and printer.

2. Insert the diagnostic diskette in drive 1 and power on the computer.

   The program will load and the main menu will be displayed.

3. Select the **Options Menu** by pressing <9>, then <Return>.

   The options menu will appear.

4. Check that the **Drive Type** indicated is appropriate for the drive under test.

   If a Disk II is being tested, the drive type should indicate **DISK][or ///**.

   If a UniDisk, DuoDisk, or Apple 5.25 Drive is being tested, the drive type should indicate **Other**.

   To change the drive type, press 1, then <Return>.

5. If the **Drive Number** shown is not the number of the drive to be tested (either 1 or 2), press 2, then <Return>.

   The drive number will "toggle" to the other drive number.

6. If the **Printer Slot** is not the slot where the printer interface card has been installed, press 3, then <Return>. Now type the slot number where the card is installed.

   The printer slot will change to the slot selected.

   Note: If the diagnostic is being run on a IIGS, make sure you configure the printer port using the control panel **prior** to printing.

7. If the **Disk Drive Slot** is not the slot where the disk controller card has been installed, press 4, then <Return>. Now type the slot number where the card is installed.

   The disk drive slot will change to the slot selected.

8. If you would like to save the new configuration, press 0, then <Return>. Now press <Space>.

   The new configuration will be saved to the diagnostic diskette.

9. The set-up is now complete. Press <Escape> to return to the main menu. Proceed to the section titled "Running the Diagnostics."

Apple IIc

1. Set up the computer, disk drive(s), monitor, and printer.

2. Insert the diagnostic diskette in drive 1 and power on the computer.

   The program will load and the main menu will be displayed.

3. Select the **Options Menu** by pressing 9, then <Return>.

   The options menu will appear.

4. If the **Drive Type** does not say **Other**, press 1, then <Return>.

   The drive type will change to **Other.**

5. If the **Drive Number** shown is not the number of the drive to be tested (either 1 or 2), press 2, then <Return>.

   The drive number will "toggle" to the other drive number.

6. If the **Printer Slot** is not set to slot 1, press 3, then <Return>. Now type 1.

   The printer slot will change to slot 1.

7. If you would like to save the new configuration, press 0, then <Return>. Now press <Space>.

   The new configuration will be saved to the diagnostic diskette.

8. The setup is now complete. Press <Escape> to return to the main menu. Proceed to the "Running the Diagnostics" section.

Apple III or III Plus

1. Set up the computer, disk drive(s), monitor, and printer.

2. Insert the *Apple II Emulation Mode* diskette in drive 1 and power on the computer.

3 When the menu appears, remove the *Emulation Mode* diskette from drive 1.

4. Place the diagnostic diskette in drive 1 and press <Return>. The program will load and the main menu will be displayed.

5. Select the **Options Menu** by pressing 9, then <Return>.

   The options menu will appear.

6. If the **Drive Type** shown is not **DISK][or ///**, press 1, then <Return>.

   The drive type will change to **DISK][or ///**.

7. If the **Drive Number** shown is not the number of the drive to be tested (either 1 or 2), press 2, then <Return>.

   The drive number will "toggle" to the other drive number.

8. If the **Printer Slot** is not the slot where the printer interface card has been installed, press 3, then <Return>. Now type the slot number where the card is installed, and press <Return>.

   The printer slot will change to the slot selected.

   Note: If the built-in serial port is being used, set the printer slot to 1.

9. If you would like to save the new configuration, press 0, then <Return>. Now press <Space>.

   The new configuration will be saved to the diagnostic diskette.

10. The setup is now complete. Press <Escape> to return to the main menu. Proceed to the "Running the Diagnostics" section.

❑ RUNNING THE DIAGNOSTICS

Prior to running the diagnostic, the software must be set up for the system configuration being used. If you have not already done so, refer to "Setup" (earlier in this section) prior to proceeding to step 1.

If you are going to perform all the diagnostic tests on the drive (using the **TEST ALL** mode), perform all the steps in "Starting Up" and "The Tests."

If you are going to perform only selected diagnostic tests on the drive, perform all the steps in "Starting Up" and proceed to the section describing the test to be done. Individual tests can be run by pressing the number of the test, then <Return>.

Starting Up

1. Place the diagnostic diskette in drive 1 and power on the computer. (If the computer is an Apple III or III Plus, load the Apple II Emulation Mode software first.)

2. When the main menu appears:

   If you are going to perform all the diagnostic tests, press 0, then <Return>. The diagnostics will be run in the order they appear in the main menu.

   If you are going to perform only selected diagnostic tests, press the number of the desired test, then <Return>. The diagnostic test selected will begin.

   Note: The diagnostic diskette must be in the disk drive to be tested. If you are testing a drive that won't boot or you suspect may not be functioning correctly, connect it to the system as drive 2 and boot the diagnostic from drive 1. After the diagnostic has finished booting, remove the diagnostic diskette from drive 1 and place it in drive 2.

❑ THE TESTS

Write Protect

The Write-Protect test will prompt you to remove and reinsert the diagnostic diskette. Do so by removing the diskette, reinserting it into the disk drive, and then pressing <Space>.

> ***Note:*** During the Write-Protect test, the drive light will remain illuminated.

If the drive is functioning properly, the change in write-protect status will be displayed on the screen and the diagnostic will continue to the next test (if using **TEST ALL**).

If the drive fails the test, the message **NO CHANGE WAS OBSERVED** will be displayed. Try removing and reinserting the diskette a second time.

If the drive passes on the second attempt, the change in write-protect status will be displayed on the screen and the diagnostic will continue to the next test (if using **TEST ALL**).

If the drive fails again, you will be returned to the main menu and **FAILED** will appear next to **Write Protect**. Refer to "What to Do If a Test Fails."

Clamping

If the test completes successfully, the program will proceed to the next test (if using **TEST ALL**), or if you selected only the clamping test, **TEST PASSED** will be displayed. Press <Return> to return to the main menu.

If the drive fails, the message **TEST FAILED** will be displayed. Try removing and reinserting the diskette. Press <Space> to rerun the test.

If the drive passes on the second attempt, proceed to the next test (if using **TEST ALL**). Otherwise, you will be returned to the main menu.

If the drive fails again, refer to "What to Do If a Test Fails."

Radial Alignment

If all tracks are read successfully, the diagnostic will continue to the next test (if using **TEST ALL**). Otherwise, you will be returned to the main menu.

If any tracks are not read successfully, refer to "What to Do If a Test Fails."

Read and Seek

If the drive can accurately position the read/write head at the test tracks, the diagnostic will continue to the next test (if using **TEST ALL**). Otherwise, you will be returned to the main menu after pressing <Space>.

If the drive cannot accurately position the head, refer to "What to Do If a Test Fails."

DSPEED

The DSPEED test will display the relative speed of the disk drive motor. If desired, a blank diskette can be used to adjust the drive speed when the DSPEED test is run independently of the other tests. Be sure to insert the blank diskette before starting the test. Then, run the DSPEED test from the main menu.

If the drive speed is within specification throughout the test, the diagnostic will continue to the next test (if using **Test All**).

If the drive speed is out of specification anytime during the test, refer to "What to Do If a Test Fails."

> ***Note:*** Diskettes removed during the DSPEED test will quite likely be partially erased. This is because the software is constantly writing and reading the diskette during this test. Partially erased diskettes will either fail to boot the next time they are used or will consistently fail the read and seek test.

Write and Verify

If the drive can be written to and read from correctly, the diagnostic will continue to the next test (if using **TEST ALL**). Otherwise, you will be returned to the main menu.

If the drive cannot be written to and read from, the test will stop. Refer to "What to Do if a Test Fails."

Hysteresis

If the check is performed successfully, the diagnostic will return to the main menu.

If not, the test will stop, return to the main menu, and indicate **FAILED** next to **HYSTERESIS**.

❑ WARNING MESSAGES

Unable To Read Test Disk.

The program had a problem reading the diskette. Check to see that the disk drive door is closed and the diskette is seated correctly. Try using the suspect diskette on a known-good disk drive. If the diskette fails again, return it to Apple.

Warning: DSPEED Self-Test Failed. Test Diskette May Be Worn.

This indicates that the test tracks used to measure DSPEED are worn and the diskette should be replaced. Continuing to use this diskette will yield inaccurate results and may cause other tests to fail. Rerun all tests after replacing the diskette.

Unable To Perform This Test Until Write-Protect Test Is Passed.

This message will appear if you attempt to run any test after failure of the write-protect test. Perform the actions listed in the "What to Do If a Test Fails" section and rerun the test.

Only A Few Uses Left On This Test Diskette.

This message will appear when you have fewer than 30 uses of the test diskette left. The diskette can still be used; however, you should be prepared to replace the diagnostic diskette with your backup copy and return the worn diskette to Apple for replacement. Remember, the diskette is not copyable.

Please Discontinue Using This Test Diskette.

This message appears when you reach the maximum number of uses for the diagnostic diskette. Immediately stop using the diskette and begin using your backup copy. Return the worn diskette to Apple for replacement.

❑ TEST CODE SUMMARY

Test Results

The diagnostic displays a test code summary upon completion of testing. This eight-digit code, along with the names of the tests that failed, should be recorded in the Dealer Comments section of the SRO form, if the drive or any modules are being returned to Apple.

> ***Note:*** The diagnostic will display a test code summary regardless of whether the drive passed or failed testing. If all tests have passed, disregard the code and return the drive to the customer.

Print Results

Upon completion of the diagnostics, **PRINT RESULTS** can be used to obtain a hard copy of the results. This "printout" can either be given to the customer or retained for your records.

1. Check to make sure that the printer is connected to the system using the proper cable and interface card (for the Apple II, II Plus, or IIe). Make sure any switches on the printer and interface card (if applicable) are set properly.

2. Make sure the printer is powered on and "selected."

3. Press 8, then <Return>.

   The results will be printed.

4. Press Q to exit the diagnostic.

❑ WHAT TO DO IF A TEST FAILS

The chart that follows tells you what to do if the diagnostic indicates a failure while you are running it. First locate the test that failed. Next look under the column for the kind of drive that was being tested. One or more corrective steps will be listed. When several steps are shown, complete the first, then rerun the diagnostic to see if the drive passes. If it does not, replace any parts you might have swapped and do the second step. Continue with this procedure until the drive is repaired and the diagnostic passes, or until you have completed all of the steps suggested.

When a step tells you to replace or adjust something, the procedure for doing so can be found in the appropriate **Technical Procedures** for the disk drive you are repairing.

❑ FAILED TEST/CORRECTIVE ACTION CHART

TEST	ACTION	
	DuoDisk, UniDisk, Apple 5.25 Drive, Apple IIc Drives	**Disk II & Disk ///**
WRITE-PROTECT	-Replace mechanical assembly -Replace analog card -Return to Apple	-Adjust write-protect switch -Replace mechanical assembly -Replace analog card -Return to Apple
CLAMPING	-Rerun test -Replace mechanical assembly -Return to Apple	-Rerun test -Replace mechanical assembly -Return to Apple
DSPEED*	-Adjust DSPEED -Replace analog card -Replace mechanical assembly -Return to Apple	-Adjust DSPEED -Replace analog card -Replace mechanical assembly -Return to Apple
READ AND SEEK	-Replace mechanical assembly -Return to Apple	-Replace mechanical assembly -Return to Apple
RADIAL ALIGNMENT	-Replace mechanical assembly -Return to Apple	-Replace mechanical assembly -Return to Apple
WRITE AND VERIFY	-Replace analog card -Replace mechanical assembly -Return to Apple	-Replace analog card -Replace mechanical assembly -Return to Apple
HYSTERESIS	-Replace mechanical assembly -Return to Apple	-Replace mechanical assembly -Return to Apple

* If the DSPEED test fails on different drives, the diagnostic diskette may need replacement.

Apple Technical Procedures

Disk Drives

Section 2 – Drive Compatibility

❑ CONTENTS

2.2 Compatibility of 3.5-inch (800K) Drive Mechanisms

❑ COMPATIBILITY OF 3.5-INCH (800K) DRIVE MECHANISMS

As of November 1985, Apple has substituted the Apple 3.5 Drive mechanism (P/N 661-0345) for the older 800K drive mechanism (P/N 661-0305) that was originally manufactured for the Macintosh internal and external drives and the UniDisk 3.5.

The two drive mechanisms are interchangeable in most cases. The compatibility chart below shows which mechanism(s) can be used in each of Apple's 3.5-inch 800K drives.

DRIVE AND CABLE COMPATIBILITY --800K MECHANISMS--

DRIVES (below)	APPLE 3.5 MECHANISM 661-0345 MFD-51W-03 (Red on Silver Label)	800K DRIVE MECHANISM 661-0305 MFD-51W or 51W-10 (Black on Silver Label)
Macintosh Internal Drive	X with yellow internal drive cable 590-0437	X with red internal drive cable 590-0167
External 800K Drive	X	X
UniDisk 3.5 Drive	X	X
Apple 3.5 Drive	X	NO

X = compatible NO = non-compatible

Note: As shown above, when you are installing the Apple 3.5 Drive mechanism in the internal drive of the Macintosh, the yellow internal drive cable must be used. When you are installing the older 800K mechanism in the internal drive of the Macintosh, you must use the red internal drive cable.

Apple 3.5 Drive

Apple Technical Procedures

Apple 3.5 Drive

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	2.7	Daisy Chain Interface Board
	2.9	800K Drive Mechanism
	2.12	Eject Switch Assembly
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	3.2	Using System Utilities (Apple IIGS)
	3.3	Formatting
	3.5	Copying
	3.6	Booting from the Apple 3.5 Drive
Section 4 – Troubleshooting	4.2	Using the Apple 3.5 Symptom Chart
	4.3	Apple 3.5 Drive Symptom Chart
Section 5 – Illustrated Parts List	5.3	Finished Goods Assembly (Figure 1)

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Apple Technical Procedures

Apple 3.5 Drive

Section 1 – Basics

❑ CONTENTS

1.2 Product Description
1.2 Compatibility
1.3 Initialization
1.3 Inserting and Ejecting Diskettes

❑ PRODUCT DESCRIPTION

Compatibility

The Apple® 3.5 Drive is a self-contained external data storage system that can record up to 800K of data on 3.5-inch double-sided disks. It works with the following systems:

- Apple IIGS™
- Macintosh™ Plus
- Macintosh 512K with ROM upgrade
- Macintosh 512K *enhanced*
- Macintosh 512K

Other 3.5-inch and 5.25-inch floppy disk drives may be daisy-chained off the connector at the rear of the Apple 3.5 Drive. The Macintosh family of computers does not support the daisy-chaining of floppy disk drives. (You can, however, connect a floppy disk drive to a hard disk.)

The Apple 3.5 Drive is similar to the other Macintosh 800K drives but has the following added features:

- DB-19 daisy-chain port and interface board
- Eject button
- LED
- Platinum case color

In general, you may use the Apple 3.5 Drive mechanical assembly in the 800K drives listed below, with the stated reservation:

- Macintosh External 800K Drive
- Macintosh Internal 800K drive — **use with the YELLOW logic board-to-drive cable only.** (The **red** logic board-to-drive cable is used only when installing a Macintosh External or Internal 800K mechanical assembly into the internal drive of the Macintosh.)

Note: The other 800K mechanical assemblies may not be used in the Apple 3.5 Drive (that is, there is downward compatibility but no upward compatibility).

The Apple 3.5 Drive 800K mechanism may be distinguished from other Apple 800K drives by the color of the label on the side of the drive mechanism itself:

- Apple 3.5 Drive — RED on silver
- All other Apple 800K drives — BLACK on silver

The Apple 3.5 Drive may also be distinguished from the Macintosh 800K internal and external drives by serial number series:

- Internal Macintosh 800K Drive — Series 51W
- External Macintosh 800K Drive — Series 51W-10
- Apple 3.5 Drive — Series 51W-03

Initialization

You may use 400K single-sided diskettes in the 800K drive. When you insert a blank unformatted diskette into the drive, the Macintosh will ask if you wish to initialize it as single or double sided. (If you are going to be using an 800K diskette in a 400K drive as well as in the Apple 3.5 Drive, you will have to initialize it as single sided — otherwise the 400K drive will not be able to read it.)

Inserting and Ejecting Diskettes

The Apple 3.5 Drive has an automatic diskette insert and eject system. The diskette is automatically ejected from the drive either by pressing the eject button or by using a software command. The eject cycle works only when the drive is under power.

Note: When the Apple 3.5 Drive is connected to a Macintosh, the eject button on the front of the drive is automatically deactivated because Macintosh software controls disk ejection. The eject button works only when the drive is connected to an Apple IIGS.

The insert cycle starts when the diskette is partially inserted into the drive, triggering a loaded spring that completes the cycle automatically.

CAUTION: *Make sure the Macintosh or Apple IIGS is powered off before connecting the disk drive to a built-in port. Failure to do so can result in damage to the drive and/or the computer's logic board.*

Apple 3.5 Drive

Section 2 – Take-Apart

❑ CONTENTS

2.3 Case
2.5 External Drive Cable and Shield
2.7 Daisy Chain Interface Board
2.9 800K Drive Mechanism
2.12 Eject Switch Assembly
2.13 LED Assembly

Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

❑ CASE

Materials Required

Small Phillips screwdriver

Remove

To remove the case:

1. Place the Apple 3.5 Drive upside down on a padded surface.

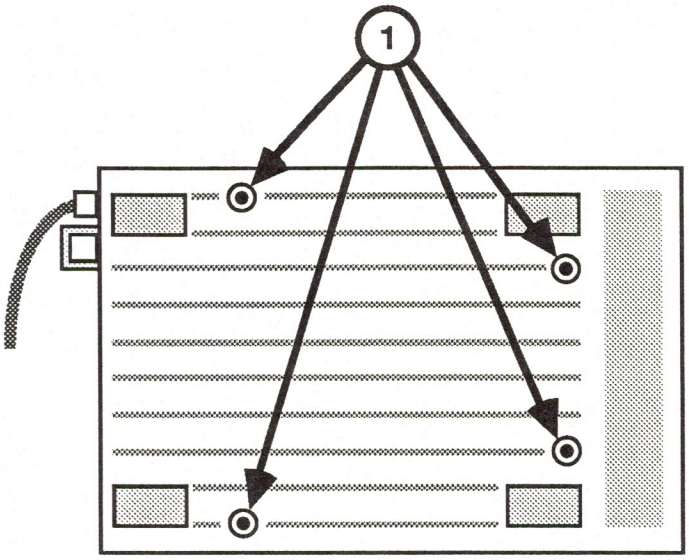


FIGURE 1

2. Remove the four screws from the case bottom (Figure 1, #1).

3. Lift off the case bottom.

4. Pull the external drive cable anchor free of the tab on the case top.

5. Grip the case top in one hand and the drive assembly in the other. Carefully slide the drive assembly as far as it will go toward the cable end.

6. Lift the drive assembly out of the case top, and set the case top and the drive assembly next to each other on the padded surface.

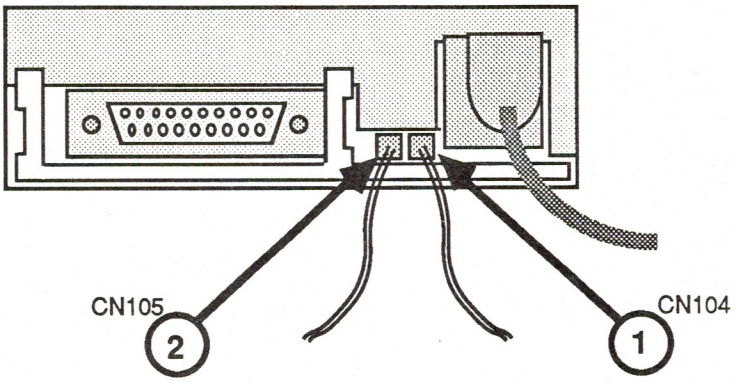


FIGURE 2

7. Using needlenose pliers if necessary, carefully disconnect the LED cable from CN104 on the drive assembly (Figure 2, #1).

8. Disconnect the eject button cable from CN105 on the drive assembly (Figure 2, #2).

Replace

To replace the case:

1. Reconnect the eject button cable to CN105 (Figure 2, #2).

2. Reconnect the LED cable to CN104 (Figure 2, #1) on the drive assembly.

3. Slide the drive assembly into the case top, making sure the metal tabs on the drive assembly fit flush against the inside of the case top. Tuck the LED cable and the eject button cable out of the way inside the edges of the case top.

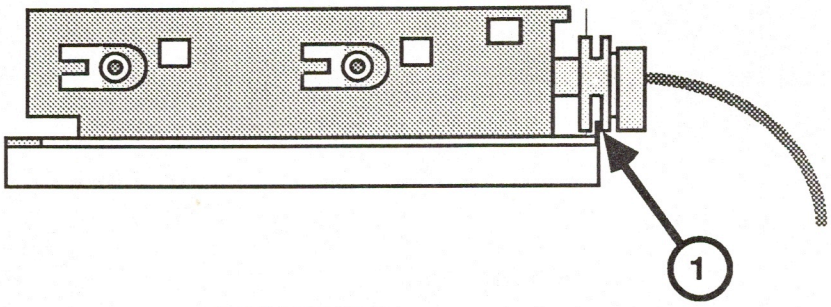


FIGURE 3

4. Now slide the drive assembly towards the front of the case top as far as it will go, so that the outermost groove on the external drive cable anchor fits over the tab on the edge of the case top (Figure 3, #1).

5. Place the case bottom over the drive assembly, fitting the external drive cable opening over the external drive cable anchor. Press the case top firmly into place.

6. Replace the four bottom screws.

❑ EXTERNAL DRIVE CABLE AND SHIELD

Materials Required

Small Phillips screwdriver

Remove

To remove the external drive cable and shield:

1. Remove the case.

...Continued on next page

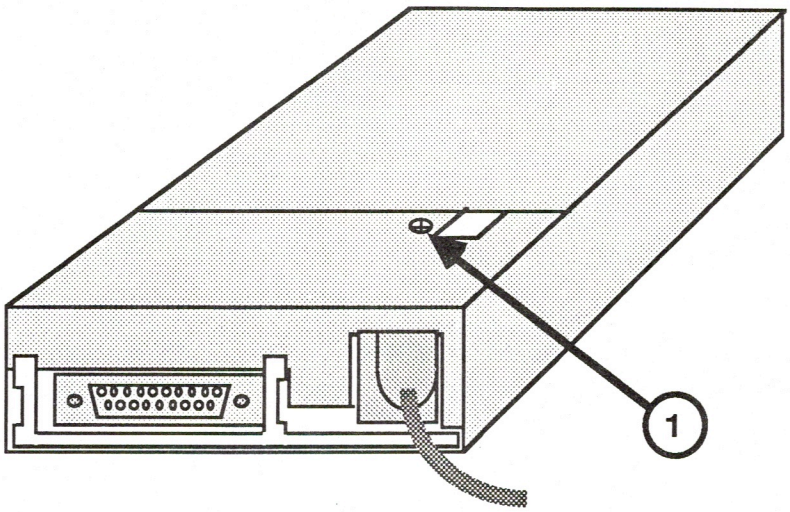


FIGURE 4

2. Remove the screw on the external drive cable shield (Figure 4, #1).

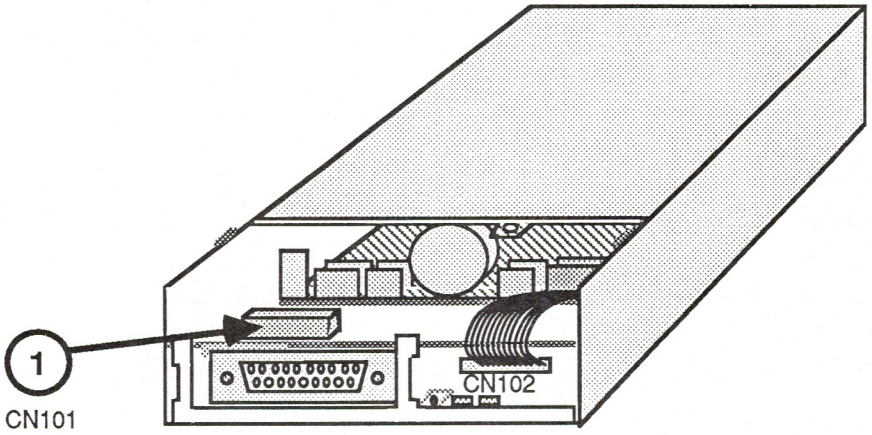


FIGURE 5

3. Disconnect the external drive cable from CN101 on the drive assembly (Figure 5, #1).

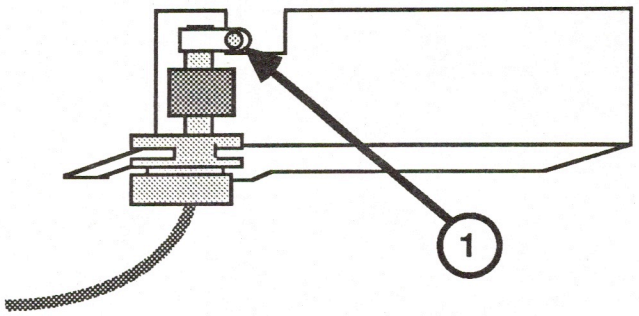


FIGURE 6

4. If you are replacing either the external drive cable or the shield, first separate them by removing the ground screw (Figure 6, #1)

Replace

To replace the external drive cable and shield:

1. Replace the ground screw if you removed it (Figure 6, #1).
2. Position the external drive cable and shield onto the drive assembly.
3. Connect the external drive cable to CN101 on the drive assembly (Figure 5, #1).
4. Replace the screw on the external drive cable shield (Figure 4, #1).
5. Replace the case.

❑ DAISY CHAIN INTERFACE BOARD

Materials Required

Small Phillips screwdriver

Remove

To remove the daisy chain interface board:

1. Remove the case and the external cable and shield.

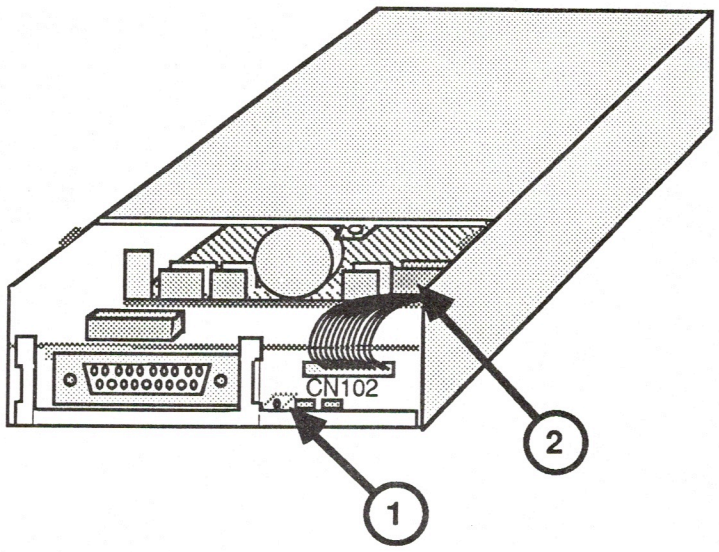


FIGURE 7

2. Disconnect CN102 from the drive mechanism (Figure 7, #2).

3. Remove the screw that secures the daisy chain interface board to the outer metal shield (Figure 7, #1).

4. Slide the daisy chain interface board to the right and lift it out.

Replace

To replace the daisy chain interface board:

1. Tuck the back edge of the daisy chain interface board under the holding tabs on the outer metal shield (Figure 7, #2).

2. Slide the board to the left as far as it will go and replace the screw (Figure 7, #1).

3. Replace the 800K drive mechanism, if you removed it.

4. Reconnect CN102 to the drive mechanism (Figure 7, #2).

5. Replace the drive cable and shield and the case.

❑ 800K DRIVE MECHANISM

Materials Required

Small Phillips screwdriver
Small flatblade screwdriver

Remove

To remove the 800K drive mechanism:

1. Remove the case and the external cable and shield.

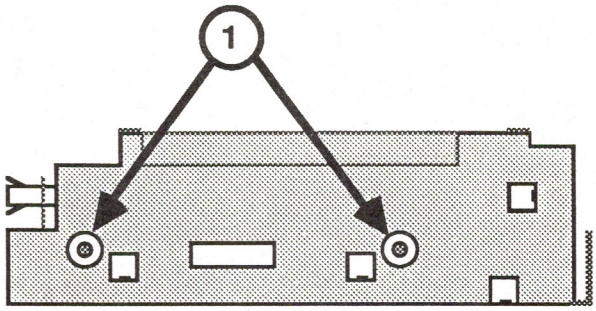


FIGURE 8

2. Remove the two screws from each side of the outer metal shield (Figure 8, #1).

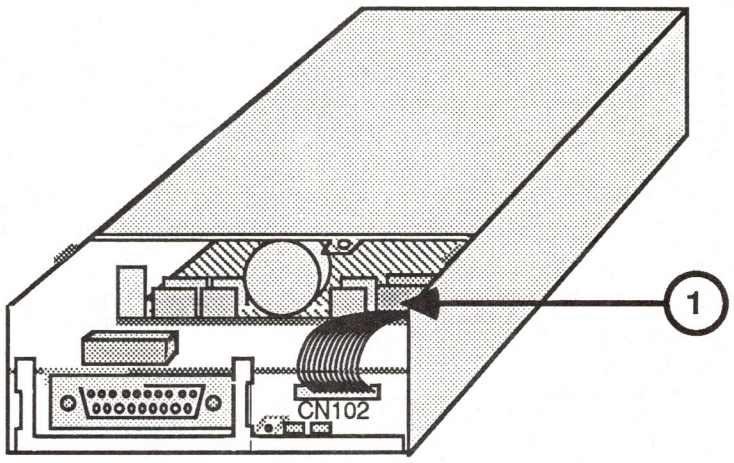


FIGURE 9

3. Disconnect CN102 from the drive mechanism (Figure 9, #1).

4. Slide the 800K drive mechanism out of the outer metal shield (away from the external cable end).

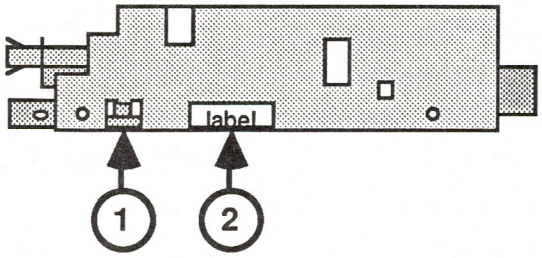


FIGURE 10

5. Slide the inner metal shield in the direction of the arrow in Figure 9 until the tabs on each side (Figure 10, #1) clear the holes, then lift off the shield. (If this is difficult, try carefully inserting a small flatblade screwdriver under the shield to free it from the tabs.)

   Note: Send the drive mechanism back to Apple **WITHOUT the inner metal shield**. (Save the shield to put on the replacement drive mechanism.) The drive mechanism **MUST** be sent back to Apple **in the shipping fixture**, with the packing diskette installed in the drive.

Replace

To replace the 800K mechanism:

1. Place the inner metal shield over the 800K drive mechanism, matching the label on the mechanism to the cutout on the shield (Figure 10, #2). Snap the shield into place.

2. Slide the drive mechanism into the outer metal shield, making sure the end with connector CN102 goes in first.

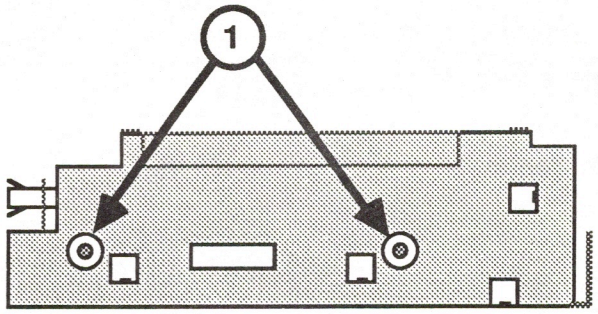


FIGURE 11

3. Replace the two screws on each side of the outer metal shield (Figure 11, #1).

4. Replace the daisy chain interface board, if you removed it.

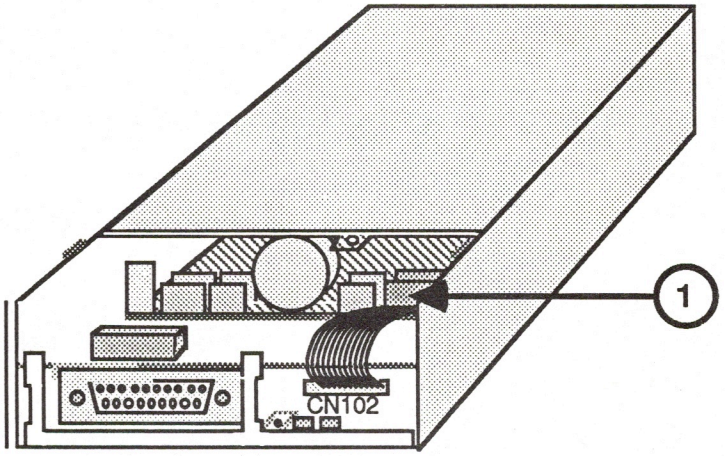


FIGURE 12

5. Connect the cable at CN102 on the daisy chain board to the drive mechanism (Figure 12, #1).

6. Replace the external drive cable and shield.

7. Replace the case.

❑ EJECT SWITCH ASSEMBLY

Materials Required

Small Phillips screwdriver

Remove

To remove the eject switch assembly:

1. Remove the case.

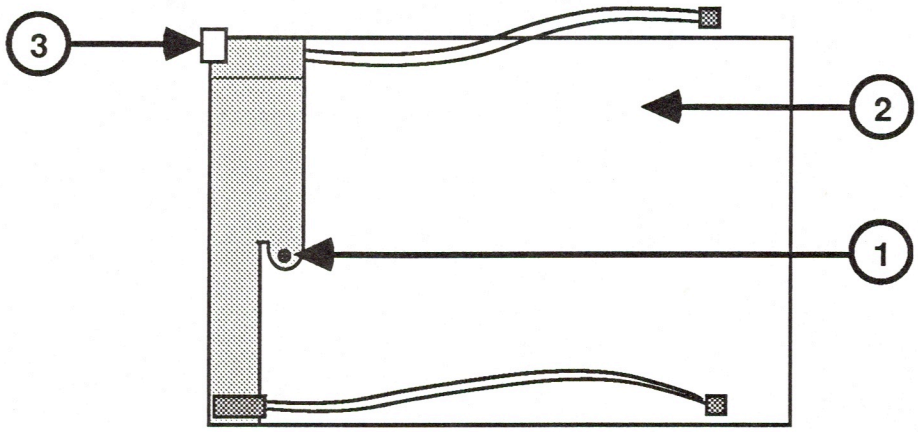


FIGURE 13

2. Remove the screw (Figure 13, #1) that secures the metal bracket to the case top (Figure 13, #2).

3. Lift the eject switch assembly (Figure 13, #3) off the holding tabs.

Replace

To replace the eject switch:

1. Position the eject switch (Figure 13, #3) over the holding tabs.

2. Replace the screw (Figure 13, #1) that secures the metal bracket to the case top.

3. Replace the case.

❑ LED ASSEMBLY

Materials Required

Small Phillips screwdriver

Remove

To remove the LED assembly:

1. Remove the case.

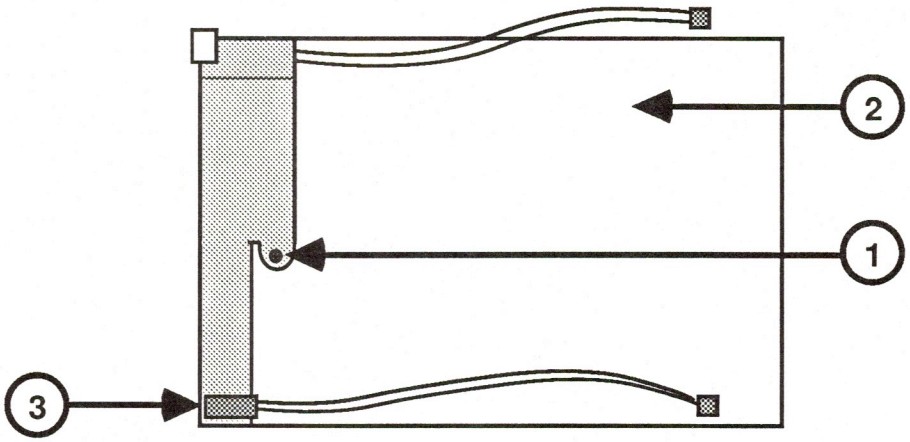


FIGURE 14

2. Remove the screw (Figure 14, #1) that secures the metal bracket to the case top (Figure 14, #2).

3. Lift the LED assembly (Figure 14, #3) off the holding tabs.

Replace

To replace the LED assembly:

1. Position the LED assembly (Figure 14, #3) over the holding tabs.

2. Replace the screw (Figure 14, #1) that secures the metal bracket to the case top.

3. Replace the case.

Apple Technical Procedures

Apple 3.5 Drive

Section 3 – Diagnostics

❑ CONTENTS

3.2 Introduction
3.2 Using System Utilities (Apple IIGS)
3.3 Formatting
3.5 Copying
3.6 Booting from the Apple 3.5 Drive

❑ INTRODUCTION

The Apple 3.5 Drive may be tested on either the Macintosh or the Apple IIGS.

1. On the Macintosh, use MacTest to do a read/write test. (Refer to the *Macintosh Technical Procedures*, Section 2, Diagnostics.)

   Note: Second and later repetitions of MacTest on an Apple 3.5 Drive may cause the "in use" LED to remain on throughout the test, even when the drive is not actually in motion. This will cause no harm and may be ignored.

2. On the Apple IIGS, use *System Utilities* to test the read/write functions of the drive as it demonstrates formatting, copying, and booting.

❑ USING SYSTEM UTILITIES (APPLE IIGS)

Introduction

The *System Utilities* diskette (version 2.1 or higher) may be used to test various functions of the Apple 3.5 Drive, among them the three procedures in this section:

1. Formatting a diskette in the Apple 3.5 Drive.

2. Copying all the files from the *System Utilities* diskette onto the formatted diskette.

3. Booting directly from the Apple 3.5 Drive using the boot diskette just created.

If the Apple 3.5 Drive displays any problems with these procedures, turn to Section 4, Troubleshooting.

Note: Refer to the *System Utilities* manual and the *Apple IIGS Owner's Guide* for more information if you are uncertain how to use the diskette with the Apple IIGS.

Materials Required

Apple IIGS
Apple 3.5 Drive to be tested
Apple 5.25 Drive or UniDisk
Disk controller card
System Utilities diskette (5.25" format)
Blank 3.5" diskette

Formatting

1. Connect the Apple 3.5 Drive to the drive port. Install an Apple 5.25 Drive (or UniDisk) in slot 6 with a disk controller card.

2. Insert the *System Utilities* diskette in the 5.25 drive.

3. Hold down <Option> and <Escape> while you power on the system. When the ROM menu comes up, type 1 to access the Control Panel.

4. Configure the Control Panel as follows:

   Slot 6: **<YOUR CARD>** (for the 5.25 drive)
   Slot 5: **<SMART PORT>** (for the 3.5 drive)
   Startup Slot: **6**

   Note: Use the up and down arrows to move from one line to another, and the left and right arrows to change the designation for each line. CAPITAL LETTERS indicate that a choice is currently selected.

   When the slots are configured correctly, press <Return>.

5. To exit the Control Panel, select **<QUIT>** and press <Return>.

   The system will boot from the 5.25 drive.

6. When asked **Prefer 80 column display?**, type Y.

7. When the *System Utilities* menu appears, use the arrows to select **<FORMAT A DISK>** and press <Return>.

8. When asked **Where is your disk?**, select **<SLOT AND DRIVE>** and press <Return>.

Note: Do not be confused if **<SLOT AND DRIVE>** is the only selection listed. Simply make sure it is selected (in capital letters) and press <Return>.

9. The screen will now appear as below:

   Slot: [**N**] (this could be any number from 1 to 7)

   Type 5 (because you will be placing your blank diskette to be formatted in the 3.5 Drive, which is designated for slot 5).

10. The screen will now appear as below:

    Slot: [**5**] Drive: [**N**] (any number from 1 to 7)

    Type 1 (because there is only one drive associated with slot 5).

11. The screen will now appear as below:

    Using Slot 5, Drive 1
    Select the operating system:

    Use the arrows to highlight **<PRODOS>** and press <Return>.

12. The screen now shows:

    Using Slot 5, Drive 1
    Operating System: ProDos
    Enter Name of New Volume: /BLANK**N**.....

    Enter any name you wish and press <Return>.

13. Place the blank diskette to be formatted in the Apple 3.5 Drive. Press <Return>.

14. If the diskette was previously formatted, you will be asked **Is it okay to destroy /OLDNAME?** Select **<YES>** and press <Return>.

    The formatting will begin. At its conclusion the message will appear: **Formatting: ....Done!**

15. Press <Return>. Then press <Escape> to return to the *System Utilities* menu.

Copying

1. From the *System Utilities* menu, select **<COPY FILES>** and press <Return>.

2. When asked **Where is your source disk?**, select **<SLOT AND DRIVE>** and press <Return>.

3. The screen will now appear as below:

   Slot: [N]

   Type 6 (because the *System Utilities* diskette you will be copying is in the 5.25 drive, which is designated for slot 6).

4. The screen will now appear as below:

   Slot: [6] Drive: [N]

   Type 1 (because there is only one drive associated with slot 6).

5. When asked **Where is your destination disk?**, select **<SLOT AND DRIVE>** and press <Return>.

6. The screen will now appear as below

   Slot: [N]

   Type 5 (because the blank formatted diskette you will be copying to is in the Apple 3.5 Drive, which is designated for slot 5).

7. The screen now shows:

   Slot: [5] Drive: [N]

   Type 1 (because there is only one drive associated with slot 5).

8. The screen will now appear as below:

   Source disk: Slot 6, Drive 1
   Destination disk: Slot 5, Drive 1

9. When asked **Select some or all files on this disk?**, select **<ALL>** and press <Return>.

10. The copying will begin. At its conclusion, the message will appear: **Copying complete!**

11. Press <Escape> to return to the *System Utilities* menu.

12. Select **<EXIT SYSTEM UTILITIES>** and press <Return>.

13. When asked **Are you sure you want to leave System Utilities?**, select **<YES>** and press <Return>.

Booting from the Apple 3.5 Drive

1. Press <Option>-<Control>-<Reset> to return to the ROM menu.

2. Type 1 to access the Control Panel.

3. Configure the Control Panel as follows:

   Slot 6: **<YOUR CARD>** (for the 5.25 drive)
   Slot 5: **<SMART PORT>** (for the 3.5 drive)
   Startup Slot: **5**

   Press <Return>.

4. Select **<QUIT>** and press <Return> to exit the Control Panel.

   The system will boot the *System Utilities* from the new diskette in the Apple 3.5 Drive.

   Note: If the Apple 3.5 Drive has performed all of these procedures, it is functioning normally.

5. Power off the system.

Apple Technical Procedures

Apple 3.5 Drive

Section 4 – Troubleshooting

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4.2 Using the Apple 3.5 Drive Symptom Chart
4.3 Apple 3.5 Drive Symptom Chart

❑ USING THE APPLE 3.5 DRIVE SYMPTOM CHART

Troubleshooting Rules

General rules for troubleshooting the Apple 3.5 Drive are:

1. Use known-good software. (It can save you a lot of time!)

2. Be sure the cable is installed securely in the external disk drive port (on the Macintosh).

3. Be sure you are addressing the correct slot (on the Apple IIGS).

4. If the Apple 3.5 Drive demonstrates a symptom listed on the chart, replace modules or parts in the order listed under the corrective action(s). If a corrective action does not fix the problem, the original module or part should be reinstalled before the next step is performed.

❑ APPLE 3.5 DRIVE SYMPTOM CHART

Symptom	Corrective Action
• *Drive will not come on.** LED flashes once or does not light*	1. Swap interface card (IIGS)* 2. Swap drive mechanism 3. Swap external drive cable 4. Swap LED assembly
• *Drive will read but not write*	1. Swap drive mechanism 2. Swap interface card (IIGS)* 3. Swap external drive cable
• *Drive will not read but LED comes on*	1. Check software 2. Swap drive mechanism 3. Swap interface card (IIGS)*
• *Drive will not eject diskette*	1. Swap drive mechanism 2. Swap eject switch cable assembly
• *Drive functions, but LED does not light*	1. Swap LED assembly 2. Swap drive mechanism

* The Apple 3.5 Drive may be connected to the Apple IIGS, either via the drive port or via a disk controller card inserted in one of the slots. If it is connected to the drive port, check to ensure that the Control Panel configuration is set up correctly for the use of the drive port. If the configuration is correct, but the drive still does not work, change the logic board.

** If the Apple 3.5 Drive 800K mechanical assembly is being used in the Macintosh internal drive, check to make sure the logic board-to-drive cable is **yellow**, not red.

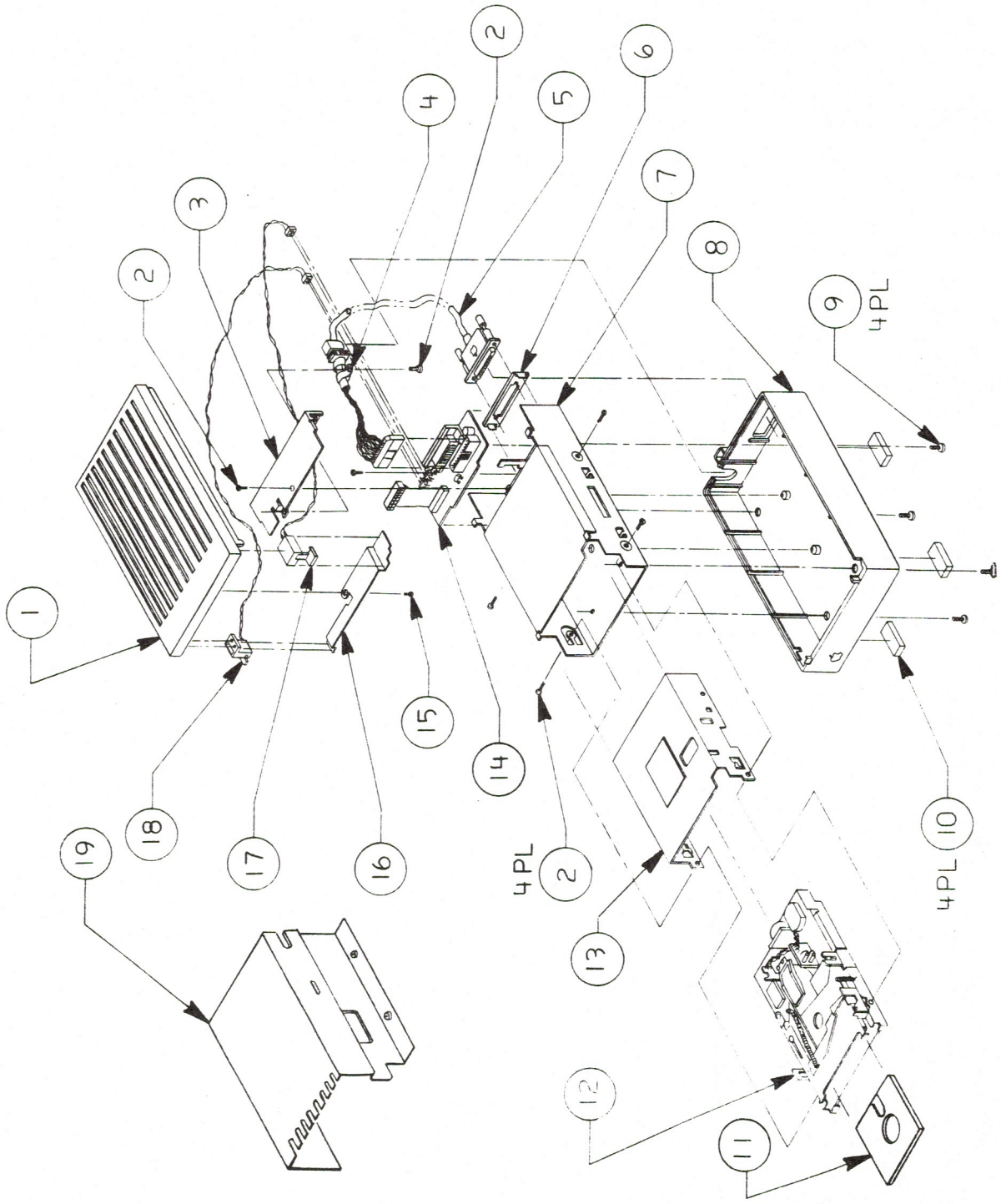
Apple 3.5 Drive

Section 5 – Illustrated Parts List

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5.3 Finished Goods Assembly (Figure 1)

The figure and list in this section include all piece parts that can be purchased separately from Apple for the Apple 3.5 Drive, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.


1
2
3
4
5
6
7
8
9
4PL
10
4PL
11
12
13
4PL
2
14
15
16
17
18
19

❑ APPLE 3.5 DRIVE – FINISHED GOODS ASSEMBLY (Figure 1)

Item	Part No.	Description
1	815-0955	Top Case, Plastic
2	416-1304	Screw, Metal Shield
3	805-0807	External Drive Cable Shield
4	805-0378	External Drive Cable Clamp
5	590-0360	External Drive Cable
6	815-0969	Daisy Chain Cover, Plastic
7	603-5106	Outer Metal Shield
8	815-0956	Bottom Case, Plastic
9	416-1305	Screw, Plastic Case
10	865-0045	Plastic Case Foot
11	003-0003	Packing Diskette (for transporting)
12	661-0345	800K Mechanism, Apple 3.5 Drive (Red on Silver Label)
13	805-0156	Inner Metal Shield
14	076-0234	Daisy Chain Interface Board
15	420-1011	Screw, Eject Switch Bracket
16	805-0811	Eject Switch Bracket
17	603-5110	Eject Switch Cable Assembly
18	603-5109	LED Cable Assembly
19	805-0217	Shipping Fixture (Shield for Internal 800K Drive)

SCSI Hard Disk Drives

Apple Technical Procedures

SCSI Hard Disk Drives

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❑ PRODUCT DESCRIPTION

Small Computer System Interface

The SCSI hard disk drives—Hard Disk 20SC, Hard Disk 40SC, and Hard Disk 80SC—utilize the Small Computer System Interface (or SCSI), which is a method of sending information back and forth between a computer and a variety of peripherals.

SCSI is a standard developed by engineers from many companies working together through the American National Standards Institute. This interface is designed to work with devices of many types from many different manufacturers, thus increasing the flexibility and sophistication of the user's system.

SCSI Advantages

The Small Computer System Interface offers several advantages over earlier methods:

Speed: Information transfer between the computer and the peripheral is much faster because SCSI sends eight bits of data at the same time (parallel).

Flexibility: SCSI is a standard, so existing system software can be used to communicate with any of the many SCSI devices from different manufacturers.

Expandability: The Apple SCSI Cable System can be used to connect as many as seven devices to the system.

SCSI Hard Disk Features

All the SCSI hard disk drives can provide expanded external storage for Macintosh Plus, Macintosh SE, or Macintosh II personal computers. The 20-megabyte 3.5-inch SCSI hard disk drive mechanism may also be installed inside the Macintosh SE or Macintosh II. The 40-MB and 80-MB 5.25-inch mechanisms may also be installed inside the Macintosh II.

Although all of the SCSI hard disk drives may be connected to the Apple IIe or Apple IIGS computers, only the external Hard Disk 20SC may be used efficiently with these systems. Since the the ProDOS operating system can handle only up to 32 megabytes, much of the data on a larger hard disk would not be accessible.

Storage equivalents of the SCSI hard disks are as follows:

- Hard Disk 20SC = 25 double-sided 3.5-inch diskettes
- Hard Disk 40SC = 50 double-sided 3.5-inch diskettes
- Hard Disk 80SC = 100 double-sided 3.5-inch diskettes

❑ CARE AND HANDLING

Handling Precautions

The SCSI hard disk drives are mechanical devices with moving parts. Rough handling such as jarring or bumping, especially during operation, can result in a mechanical failure or damage to the information stored on the hard disk. Careless handling accounts for more drive failures than all other factors combined. With this in mind, always be sure to:

- Leave finished-goods SCSI hard disk drives and hard disk drive mechanisms in the shipping containers until use.
- Place the SCSI hard disk drive on a soft, grounded surface before beginning any repair procedure.
- Use the shipping containers and packing materials when transporting finished-goods SCSI hard disk drives or hard disk drive mechanisms.
- Never move the drive during power-down. After the power is turned off, the discs will slow and the heads will land within 15 seconds. Any jolts to the drive during the power-down period may cause the heads to crash into the media surfaces.
- Never drop a SCSI hard disk drive. Even a drop of one inch to a hard surface could cause drive failure.

ESD Prevention

Some of the components in the drive are sensitive to electrostatic discharge (ESD), which may be generated by your body, clothing, or articles in the environment. With this in mind, be sure to:

- Keep the disk drive mechanism in its antistatic bag until you are ready to install it in the case.
- Work on a grounded mat and use a grounding wrist-strap.
- Keep common plastics, vinyl, polyester, and styro-foam away from the disk drive.
- Do not touch the printed circuit board.

❑ CONFIGURING EXTERNAL SCSI DEVICES

External SCSI hard disk drives are connected to the SCSI port on the rear of the Macintosh Plus, Macintosh SE, or Macintosh II, or to a SCSI Interface Card installed in the Apple IIe or Apple IIGS. If additional storage is needed, the user can "daisy-chain" more SCSI hard disk drives to the first SCSI hard disk.

A priority number is what controls the accessing of all SCSI devices connected to a system. A separate priority number must be assigned to every SCSI device: one device, one number. This prevents two devices from sending data at the same time, which could damage files already saved.

The Macintosh SE or Macintosh II internal SCSI hard disk will have a priority number assigned automatically by the system. On the external hard disks, the priority is set by inserting an opened paper clip into the hole of the SCSI switch and clicking until the desired number is displayed. (The SCSI select switch is on the back of the hard disk case, below the SCSI ports.)

❑ THINGS TO REMEMBER

Switching On

If you have connected an external SCSI hard disk to the external SCSI port of a Macintosh, power on the hard disk before you turn on the computer. The hard disk will whir. In 5 to 20 seconds the hard disk will give a signal noise and the drive will be ready. Then power on the Macintosh.

If you are using a SCSI hard disk with a SCSI Interface Card in an Apple IIe or Apple IIGS, insert the card into the system with the power off. Slot 5 is the first choice, slot 2 is the second choice. (You must use slot 2 for testing.) If you wish to boot directly from the hard disk, the SCSI Interface Card must be in a higher-numbered slot than any other card you are using. Be sure the SCSI select switch on the hard disk is set at a lower number than the priority setting of the SCSI Interface Card. (Refer to Section 5, SCSI Interface Card.)

Switching Off

In normal operation, the LED at the front of the SCSI hard disk indicates that the drive is in operation. Never switch off the power if the LED is on. You may lose data on the hard disk. To power off, wait until the hard disk's LED is off. Then power off the computer, and then the hard disk (if external).

❑ REINITIALIZING A SCSI HARD DISK

When you reinitialize a customer's hard disk, **everything** is removed. Try using *Disk First Aid* before you reinitialize (see instructions in this section). If you **must** reinitialize, notify the customer and find out if his files are backed up. Depending on the type of damage the hard disk has sustained, you may be able to back up the files by copying onto diskettes or tape.

With a Macintosh

1. Set up the SCSI hard disk with a Macintosh Plus, Macintosh SE, or Macintosh II.
2. Insert the *Hard Disk Drive Diagnostic* diskette into the Macintosh internal drive and turn on the system.
3. Open the file **SCSI Hard Disk Installer** and follow the screen prompts to initialize the hard disk.
4. Recopy any desired applications and backed-up files onto the hard disk.

With an Apple IIe or IIGS

1. Insert the SCSI Interface Card in slot 2 of an Apple IIGS or IIe and connect the Hard Disk 20SC. Connect a 5.25" drive to a disk controller card inserted in slot 6.
2. Insert the *Apple II SCSI Diagnostic* diskette into the external 5.25" drive and power on the system.

   Note: If you are using an unenhanced Apple IIe, the screen displays may be distorted. This is due to the use of MouseText in the diagnostic program.
3. Select **Hard Disk 20SC Tests** from the menu.
4. Select **Utilities** from the Main Menu.
5. Select **Reformat the Hard Disk 20SC**, and follow the screen prompts.
6. On completion, use *System Utilities* (version 2.1 or higher) to reformat the Hard Disk 20SC **again**. (Both reformatting routines must be done to reinitialize the Hard Disk 20SC completely.)

❑ DISK FIRST AID

Disk First Aid can be used to repair any hard disk or double-sided 800K diskette that uses the Macintosh hierarchical file system (HFS). The application can **only** be run on a Macintosh-initialized hard disk or diskette. *Disk First Aid* is included on the *Hard Disk Drive Diagnostic* diskette for the Macintosh family. The diskette must be used as the startup diskette. (If the hard disk were the startup, the application could examine but not repair the disk.) To use *Disk First Aid* to repair a SCSI hard disk:

1. Insert the *Hard Disk Drive Diagnostic* diskette into the internal drive of the Macintosh Plus, Macintosh SE, or Macintosh II.

2. Power on the SCSI hard disk and wait for the ready signal. Then power on the Macintosh.

3. Open the diskette icon, then the **Disk First Aid** icon.

4. A display window will list one of the attached drives. Click on **Drive** to change selections. When the SCSI hard disk is listed, click on **Open**.

5. A second screen appears, as below:

   Ready to start
   Volume: (Name of SCSI hard disk)

   Select **Repair Automatically** from the **Options** menu.

6. Click on **Start** to begin the verification and repair process. You may stop the application at any time by clicking on the **Stop** button. Or you may choose **Pause**, then **Resume**.

7. When the SCSI hard disk has been verified and/or repaired, pull down the **File** menu and click on **Close**. You may repair another attached disk by choosing **Open Volume** from the **File** menu. This selection brings back the first window, which allows you to select the drive to be repaired.

8. When you are finished, select **Quit** from the **File** menu.

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Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

❑ INTRODUCTION

Drive Mechanisms

The SCSI hard disk drive mechanisms come in storage sizes of 20, 40, and 80 megabytes. All the drives are available in the 5.25-inch format, and the 20-MB drive is also available in the 3.5-inch format.

Any of the drive mechanisms may be used in the **external** drive case. The 20-MB 3.5-inch drive can also be used **inside** the Macintosh SE, and all except the 20-MB 5.25-inch drive can be used **inside** the Macintosh II.

This section gives take-apart directions for the external (finished-goods) SCSI drives. (Replacement of internal SCSI drives is described in the *Macintosh SE* and *Macintosh II Technical Procedures.*)

The external cases are the same for all drives. The 5.25-inch hard disk assemblies fill the allotted space inside the external case; the 3.5-inch drive assembly does not (although it is attached to the same full-size metal frame used with the 5.25-inch drive mechanisms). **The figures in this section show a typical 5.25-inch drive assembly. Where a procedure differs for particular drive models, a note appears in the text.**

Shipping Frames

The 3.5-inch 20-MB drive assembly is shipped in the frame that fits inside the Macintosh SE. The 40-MB and 80-MB 5.25-inch drive modules come in the frame that fits inside the Macintosh II. **Only the 20-megabyte 5.25-inch drive module comes in the frame that fits into the external drive case.**

When replacing a drive module, refer to the chart below to find out if you need to change the frame:

	Shipped in frame that fits in:	Change frame to install in:
20-MB 3.5"	Macintosh SE	External case Macintosh II
20-MB 5.25"	External case	N/A
40-MB 5.25"	Macintosh II	External case
80-MB 5.25"	Macintosh II	External case

Cables

The drive modules are shipped with the cables listed in the chart below. (The power cable, which is not needed for the external drive, is included with those modules that may be installed internally in the Macintosh SE and Macintosh II.)

	Power	50-pin SCSI	LED	SCSI Select
20-MB 3.5"	Yes	No	Yes	No
20-MB 5.25"	No	No	Yes	Yes
40-MB 5.25"	Yes	No	No	No
80-MB 5.25"	Yes	No	No	No

❑ CASE TOP

Materials Required

#2 jeweler's screwdriver

Remove

Follow the steps below to remove the case top:

1. Locate the two holding tabs on the rear of the hard disk, within the ventilation slots on either side of the top SCSI connector (Figure 1, #1).

2. Using a jeweler's screwdriver, press in gently on the lower end of each tab as you push the case top up slightly.

3. Locate the four tab holes, two on each side of the hard disk (see Figure 1, #2). Starting with the rear holes, free the tabs by gently inserting the screwdriver **straight** into each of the holes, nudging the case top up as you release each tab. **Prying is not necessary and may damage the case.**

4. When all tabs are released, lift the case free.

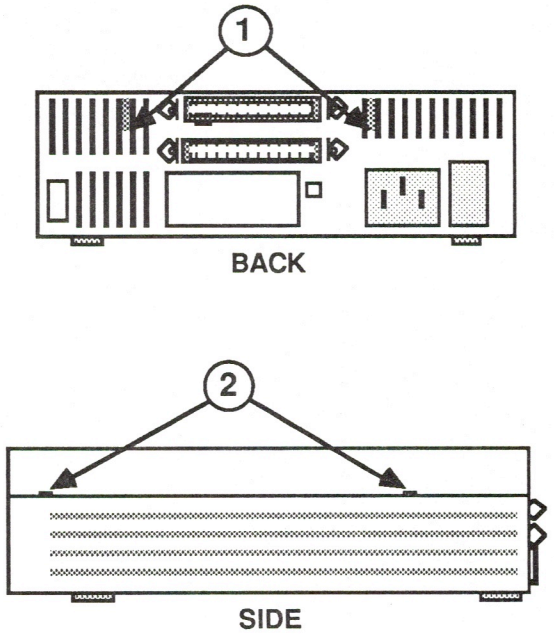


FIGURE 1

Replace

Follow the steps below to replace the case top:

1. Fit the front of the case top under the front lip of the case bottom.

2. Gently push the case top down, making sure the metal shields are tucked in.

   You will hear a click when the tabs are seated.

❑ POWER SUPPLY

Materials Required

#2 jeweler's screwdriver

Remove

Remove the power supply as follows:

1. Remove the case top.

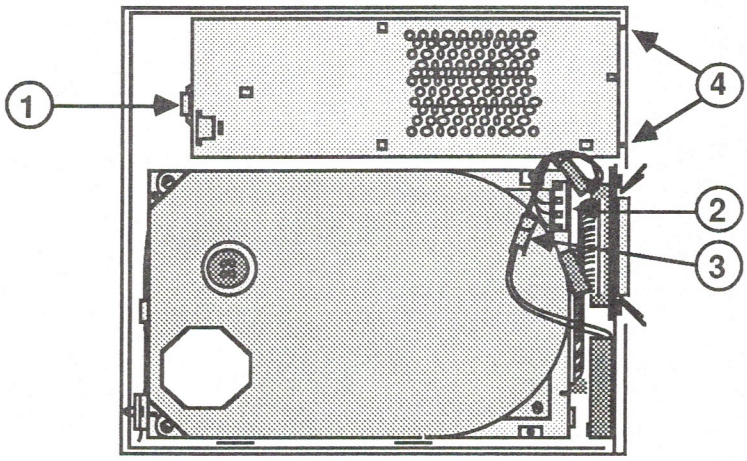


FIGURE 2

2. Push back the power supply tab (Figure 2, #1), lift up the front edge of the power supply, and rest it on the front of the case.

3. Disconnect the power supply cable from the hard disk assembly (Figure 2, #2).

   Note: On some hard disk assemblies, the power supply connector is located on the opposite side of the hard disk.

4. Disconnect the fan cable by releasing the little holding clip on the connector (Figure 2, #3).

5. Lift the power supply free.

Replace

Replace the power supply as follows:

1. Place the power supply loosely into the drive case with its front edge resting on the front edge of the case.

2. Connect the fan cable (Figure 2, #3). It fits only one way.

3. Connect the power supply cable to the hard disk assembly (Figure 2, #2). It fits only one way.

   Note: On some hard disk assemblies, the power supply connector is located on the opposite side of the hard disk.

4. Carefully slide the power supply toward the tabs on the inside back of the case bottom (Figure 2, #4) until the tabs fit into the holes in the power supply's metal case.

5. Carefully settle the power supply into place, so that the edge of the metal bracket fits under the tab (Figure 2, #1).

6. Replace the case top.

❑ HARD DISK ASSEMBLY

Materials Required

#2 jeweler's screwdriver
Needlenose pliers

Remove

Remove the hard disk assembly as follows:

1. Remove the case top.

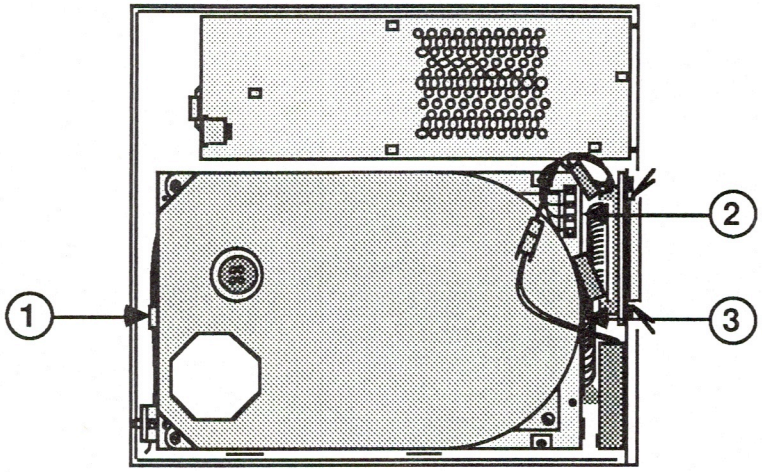


FIGURE 3

2. Push back the large tab (Figure 3, #1), slide the hard disk up, and rest it on the front edge of the case.

3. Disconnect the power supply cable (Figure 3, #2).

   Note: On some hard disk assemblies, the power supply connector is located on the opposite side of the hard disk.

4. Open the end tabs (if present) on the HDA-to-case cable connector (Figure 3, #3) and disconnect the cable from the hard disk assembly.

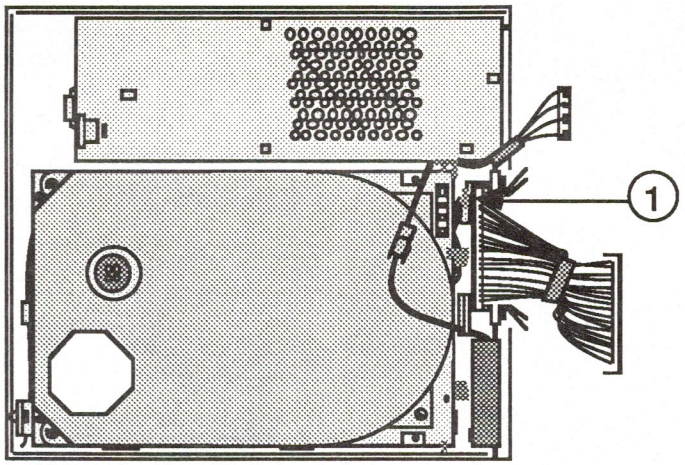


FIGURE 4

5. Disconnect the SCSI select switch cable (Figure 4, #1).

6. Lift the hard disk assembly out of the case.

Preparing HDA Modules for Installation

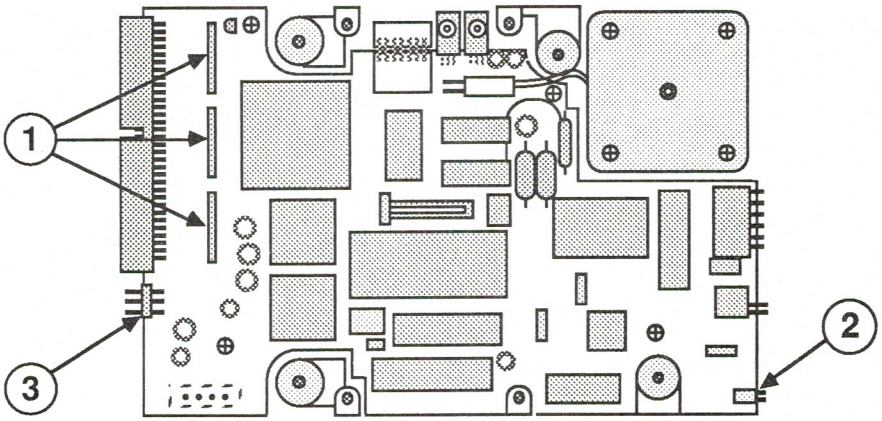
Only the 20-MB 5.25-inch HDA assembly is shipped in the frame that fits inside the external case. When you have removed a defective 20-MB 5.25-inch HDA, send it back to Apple in its own frame, with the LED assembly and SCSI select switch cable left on. (Install the 20-MB 5.25-inch replacement module "as is," according to the HDA replacement procedure, which follows this section.)

All other HDA modules must be removed from their shipping frames and placed in the customer's frame, according to the procedures immediately following. (Retain the shipping frame to send back with the defective module.)

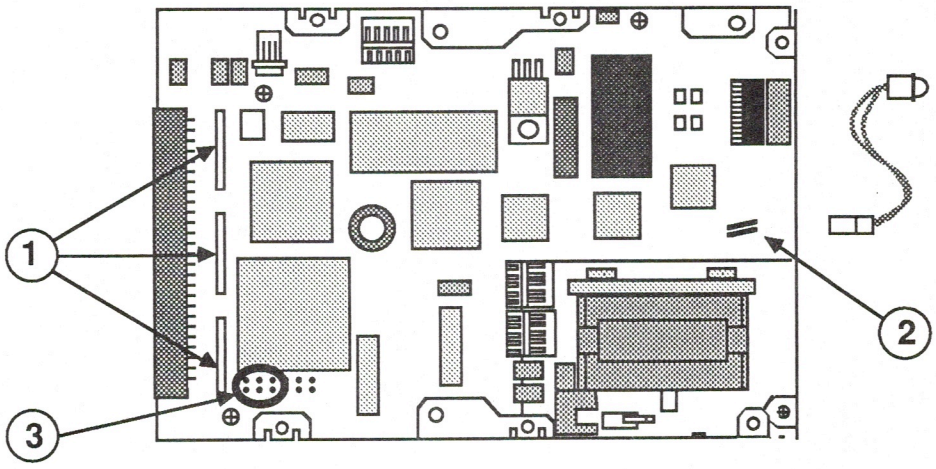
Preparing the 3.5-Inch HDA Module

The 3.5-inch drive module is shipped in a close-fitting metal frame that fits inside the Macintosh SE. Before you install the module in the external case, you must transfer the HDA to the customer's larger frame, remove the resistor packs, remove the power cable, and reattach the LED and SCSI select cables, as explained in the following procedure.

Note: There are two vendors for the 3.5-inch 20-MB hard disk assembly: Rodime and MiniScribe. The two designs have the same functionality and the same part number, but differ slightly in board layout. Figure 5 shows both a Rodime and a MiniScribe hard disk assembly.



Rodime



MiniScribe

FIGURE 5

1. Using needlenose pliers, pull straight up to remove the three resistor packs from the HDA board (Figure 5, #1).

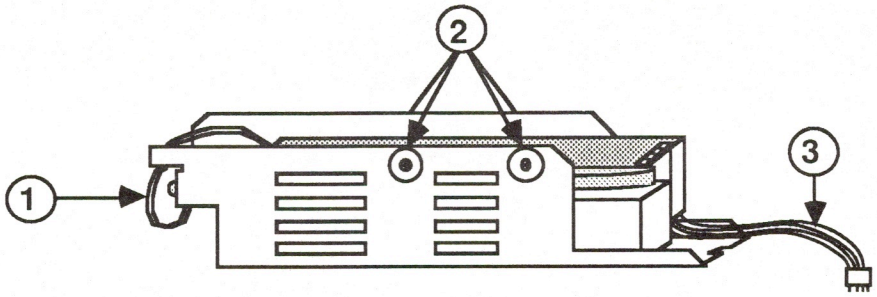


FIGURE 6

2. Disconnect the LED cable (Figure 6, #1) from the connector on the HDA board. (Do not disconnect the LED from the metal frame.)

3. Remove the four screws, two on each side of the metal frame (Figure 6, #2). Lift the assembly out of the small shipping frame and set the frame aside.

4. Disconnect the power cable (Figure 6, #3) from the HDA and set it aside. (On the MiniScribe drive assembly, the power cable is on the opposite side.)

5. Place the HDA (board side up) on the workbench pad. Bring the customer's frame close over the HDA and connect the LED cable from the customer's frame to the LED connector on the HDA board (Figure 5, #2), with the little tab on the cable connector pointing up and the wires pointing down.

6. Connect the SCSI select cable from the customer's frame to its six connector pins on the HDA board (Figure 5, #3).

   Note: The SCSI select connectors on the HDA boards are unkeyed rows of pins. When attaching the customer's SCSI select cable, orient the cable connector according to the directions below:

   - Rodime: The little tab (or "key") on the SCSI select cable connector should be pointing up.

   - MiniScribe: The SCSI select cable connector attaches to the three **outermost** pairs of pins on a 12-pin connector (the three pairs of pins closest to the large 50-pin SCSI connector). The little "key" on the cable connector should be pointing to the outside edge of the board.

7. Match the four screw holes on the top (board side) of the HDA to those on the bottom of the frame, and install the four screws.

   Note: Attach the small shipping frame, resistor packs, and power cable to the defective 3.5-inch HDA module before you ship it to Apple.

Go on to the HDA replacement procedure.

Preparing the 40- and 80-MB HDA Modules

The 40- and 80-MB drive modules (which are physically identical) are shipped in the frame that fits inside the Macintosh II. Before you can install these modules in the external case, you must transfer the HDA to the customer's frame, as explained below.

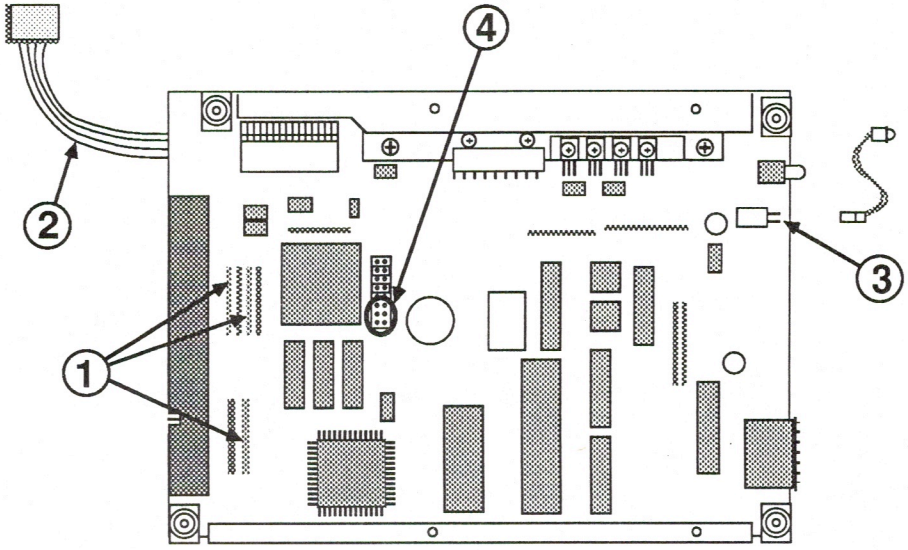


FIGURE 7

1. Remove the four screws from the bottom of the metal shipping frame, and lift the assembly out of the frame. Set the shipping frame aside.

2. Remove the **yellow** resistor packs (Figure 7, #1) by pulling them straight up, using needlenose pliers. (Leave the blue resistor packs in place.)

3. Disconnect the power cable (Figure 7, #2).

4. Place the HDA (board side up) on the workbench pad. Bring the customer's metal frame close over the HDA. Connect the LED cable from the customer's frame to to the LED connector on the HDA board (Figure 7, #3), with the little tab on the cable connector pointing up and the wires pointing down.

5. The SCSI select cable connector on this HDA board is simply an unkeyed double row of sixteen pins. Connect the SCSI select cable from the customer's frame to the three pairs of pins that are closest to the center of the board (Figure 7, #4). (Leave the small black jumpers on the other pins.) Be sure the little tab (the "key") on the SCSI select cable connector is oriented toward the large 50-pin SCSI connector at the back end of the board.

6. Match the four screw holes on the HDA to those on the frame, and install the four screws.

   Note: Attach the shipping frame, resistor packs, and power cable to the defective HDA before returning it to Apple.

Go on to the HDA replacement procedure.

Replace

1. Be sure you have properly prepared the HDA module for installation in the customer's case. The 20-MB 5.25-inch HDA service module does not need preparation prior to installation. **All other HDA service modules must be prepared as directed. If you neglect to remove the resistor packs, the drive will not function properly in the customer's system.** (See the preceding section for directions.)

2. Place the hard disk assembly loosely into the case bottom near its final position.

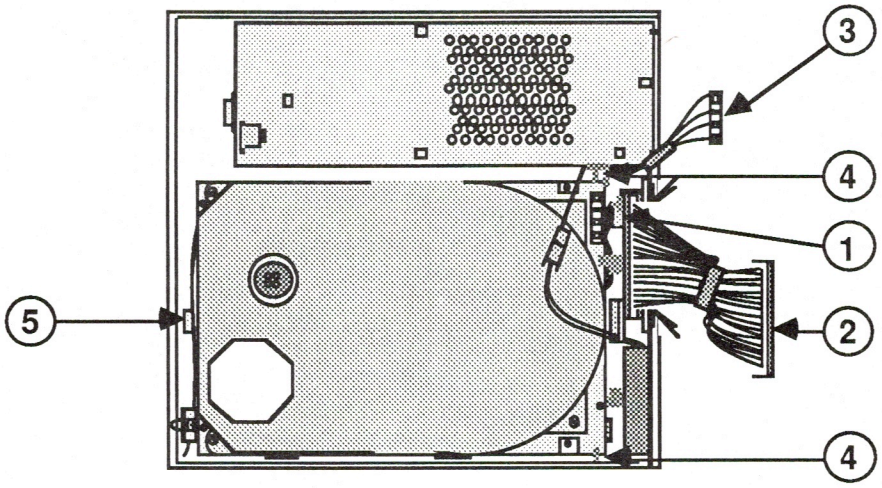


FIGURE 8

3. Connect the SCSI select switch cable (Figure 8, #1).

4. Connect the HDA-to-case cable (Figure 8, #2) to the hard disk assembly and close the end tabs.

5. Connect the power supply cable (Figure 8, #3).

   Note: On some hard disk assemblies, the power supply connector is located on the opposite side of the hard disk.

6. Slide the hard disk assembly toward the small tabs on the case bottom (Figure 8, #4) until the back edge of the metal frame is in place under the tabs.

7. Push back the holding tab (Figure 8, #5) and carefully settle the hard disk assembly into place.

8. Replace the case top.

❑ SCSI SELECT SWITCH CABLE

Materials Required

Small flatblade screwdriver
#2 jeweler's screwdriver

Remove

To remove the SCSI select switch cable:

1. Remove the case top.
2. Remove the hard disk assembly.

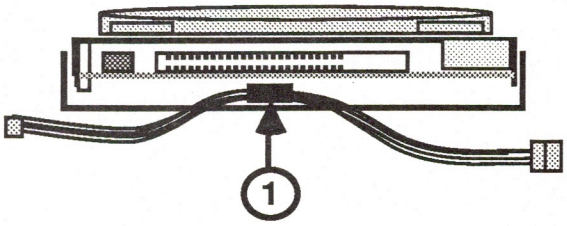


FIGURE 9

3. Take note of where and how the SCSI select switch cable is connected to the hard disk, and then disconnect the cable.
4. Slide the cable out of the holding clamp(s) (Figure 9, #1). (On one type of clamp, you may need to use a small screwdriver to break the adhesive before you can slide the cable out.)

Replace

To replace the SCSI select switch cable:

1. Lift up (or open) one side of the holding clamp(s) (Figure 9, #1) and slide the cable into place. Make sure the cable is routed as shown.
2. Connect the SCSI select switch cable to the hard disk assembly. For the connector location and the correct orientation of the cable connector key, refer to Figures 5 and 7 (and accompanying text) in this section.
3. Replace the hard disk assembly.
4. Replace the case top.

❑ LED CABLE ASSEMBLY

Materials Required

#2 jeweler's screwdriver

Remove

To remove the LED cable assembly:

1. Remove the case top and the hard disk assembly.

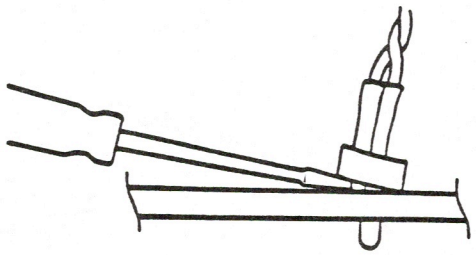


FIGURE 10

2. Pry the small plastic retaining ring from around the LED holder with a jeweler's screwdriver (Figure 10). Slide the retaining ring up the wires and out of the way.

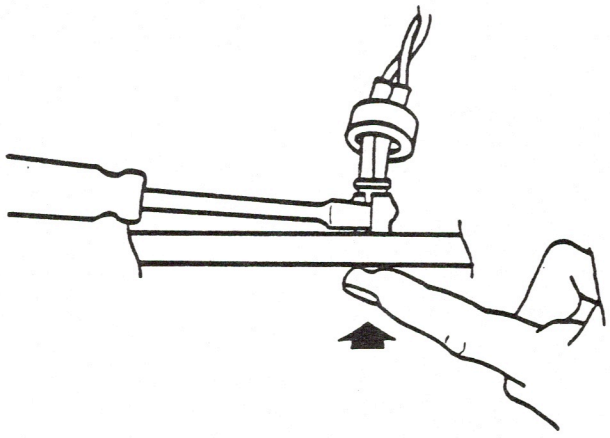


FIGURE 11

3. Press the face of the LED toward the inside of the metal frame while gently prying apart the LED holder with the screwdriver until the LED snaps free of the metal frame (Figure 11).

Replace

To replace the LED cable assembly:

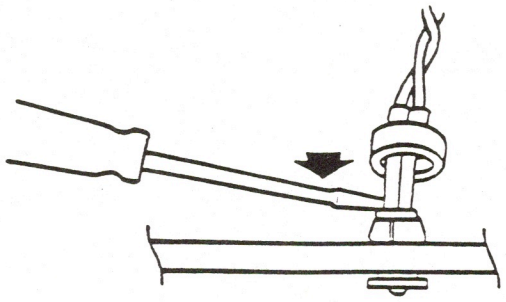


FIGURE 12

1. Slip the LED into its holder and snap it into place with a jeweler's screwdriver (Figure 12).

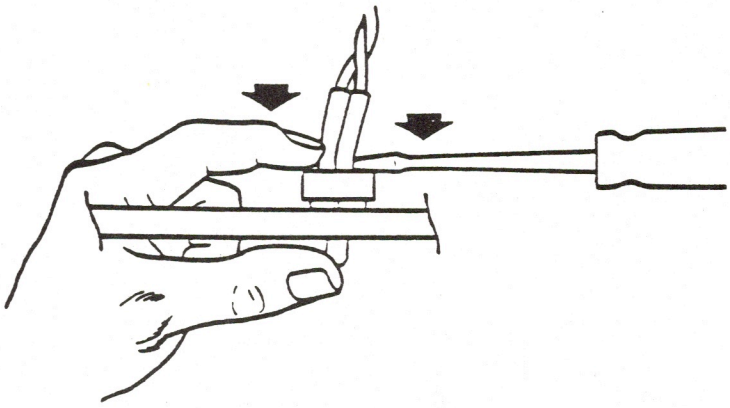


FIGURE 13

2. Slide the retaining ring down the wires and position it around the LED holder. Push the ring back into place with the screwdriver (Figure 13).
3. Connect the LED cable connector to the hard disk.
4. Replace the hard disk assembly.
5. Replace the case top.

❑ FAN FRAME

Materials Required

Medium flatblade screwdriver
#2 jeweler's screwdriver

Remove

To remove the fan frame:

1. Remove the case top.

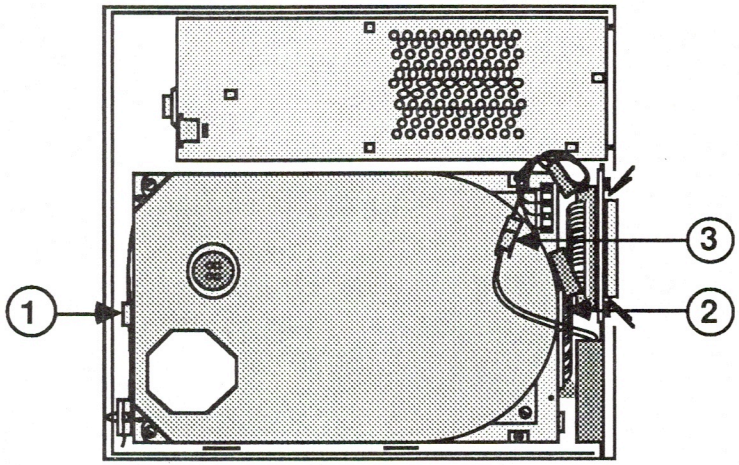


FIGURE 14

2. Push back the large holding tab (Figure 14, #1) and slide the hard disk assembly (with metal frame) up and back a little so that you have room to work.

3. Open the end tabs (if present) on the HDA-to-case cable connector (Figure 14, #2) and disconnect the cable from the hard disk.

4. Disconnect the fan cable by releasing the little holding clip on the connector (Figure 14, #3).

5. Disconnect the SCSI select switch cable from the SCSI select switch (Figure 15, #1).

6. Using a flatblade screwdriver, push back the tab (Figure 15, #2) that secures the metal fan frame.

7. Lift out the metal frame (with fan, HDA-to-case cable, fan cable, and SCSI select switch attached).

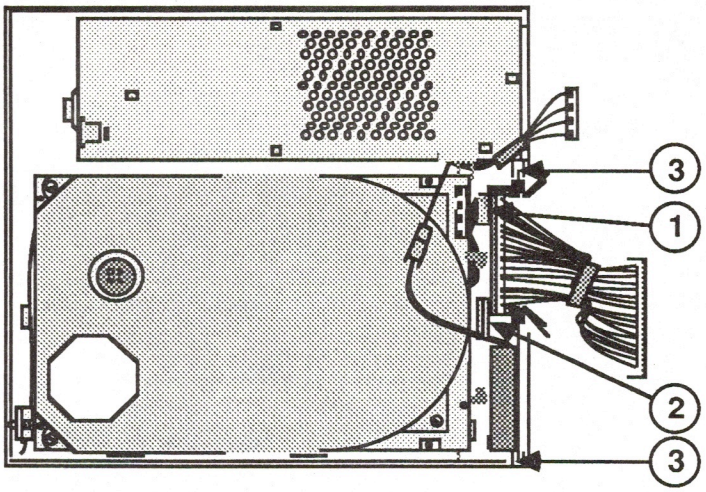


FIGURE 15

Replace

To replace the fan frame:

1. Slide the side edges of the metal fan frame into the **center** slots of the holding tabs located on the inside of the case bottom (Figure 15, #3).

2. Push back the tab (Figure 15, #2) and set the fan frame in place (with fan, HDA-to-case cable, fan cable, and SCSI select switch attached).

3. Connect the SCSI select switch cable (Figure 15, #1).

4. Connect the fan cable (Figure 14, #3). It fits only one way.

5. Connect the HDA-to-case cable (Figure 14, #2) to the hard disk and close the end tabs, if present.

6. Slide the hard disk assembly back into position, push back the holding tab (Figure 14, #1), and carefully settle the hard disk into place.

7. Replace the case top.

❑ FAN

Materials Required

#2 Phillips screwdriver
#2 jeweler's screwdriver
Medium flatblade screwdriver

Remove

To remove the fan:

1. Remove the case top.

2. Remove the fan frame.

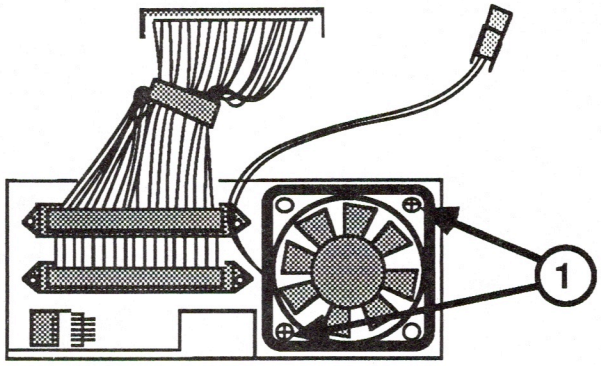


FIGURE 16

3. Remove the two screws (Figure 16, #1) that secure the fan to the frame, and lift the fan free.

Replace

To replace the fan:

1. Set the fan in position in the fan frame.

2. Replace the two screws (Figure 16, #1) that secure the fan to the frame.

3. Replace the fan frame.

4. Replace the case top.

❑ HDA-TO-CASE CABLE

Materials Required

#2 Phillips screwdriver
#2 jeweler's screwdriver
Medium flatblade screwdriver

Remove

To remove the HDA-to-case cable:

1. Remove the case top.

2. Remove the fan frame.

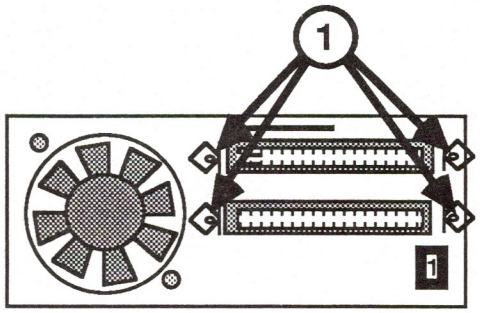


FIGURE 17

3. Remove the four screws (Figure 17, #1) that secure the HDA-to-case cable to the frame and lift the cable free.

Replace

To replace the HDA-to-case cable:

1. Set the cable connectors in place in the appropriate openings in the metal frame.

2. Replace the four screws (Figure 17, #1) that secure the HDA-to-case cable to the metal frame.

3. Replace the fan frame.

4. Replace the case top.

❑ SCSI SELECT SWITCH

Materials Required

#2 Phillips screwdriver
#2 jeweler's screwdriver
Medium flatblade screwdriver

Remove

To remove the SCSI select switch:

1. Remove the case top.

2. Remove the fan frame.

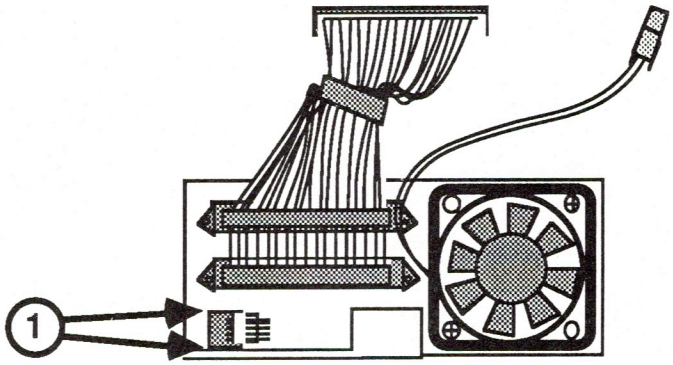


FIGURE 18

3. Using your fingers, squeeze down on all four plastic arms on the back of the switch (Figure 18, #1).

4. Holding down the plastic arms, pass the switch from inside to outside through the opening in the metal case.

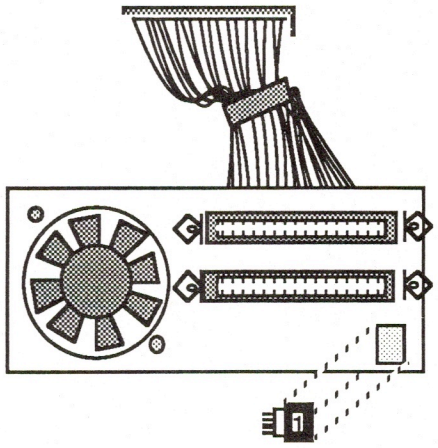


FIGURE 19

Replace

To replace the SCSI select switch:

1. Holding down the four arms of the switch, pass the switch from outside to inside through the opening in the metal case (Figure 19), and release the arms.

2. Replace the fan frame.

3. Replace the case top.

Apple Technical Procedures

SCSI Hard Disk Drives

Section 3 – Diagnostics

❑ CONTENTS

3.2 Test Versions
3.2 Tests Run on the Macintosh
3.2 Tests Run on the Apple II
3.3 Macintosh Hard Disk Drive Diagnostic
3.3 Introduction
3.3 Materials Required
3.3 Running the Test
3.5 Apple II SCSI Diagnostic
3.5 General Information
3.6 Things to Remember
3.7 Materials Required
3.7 How to Make Selections
3.8 Test Selection Menu
3.9 Tests for the Hard Disk 20SC Disk Drive
3.10 Choose Tests
3.11 Options
3.11 Special
3.11 Utilities
3.12 Running the Diagnostic
3.15 Full Scan Drive Repairs

❑ TEST VERSIONS

All SCSI Hard Disk Drives can be tested from a Macintosh Plus, Macintosh SE, or Macintosh II, and the Hard Disk 20SC can be tested from an Apple IIe or IIGS, using the tests and equipment described below.

IMPORTANT: *Ask the customer which computer (Macintosh or Apple II family) was used to format the SCSI hard disk; then test it* ***only*** *with a similar system.*

Tests Run on the Macintosh

The *Hard Disk Drive Diagnostic*, the test program that is used with the Macintosh family of computers, is a pass/fail functionality test for hard disks. It is contained on the *Macintosh Hard Disk Drive Diagnostic* diskette.

The test can be run on the Macintosh Plus, Macintosh SE, and Macintosh II, and will test both internal and external 20-, 40-, and 80-megabyte hard disk drives.

Note: The diskette also contains the following useful applications, which are explained in the Basics section:

- *Disk First Aid™* - repairs damage to file system structures on HFS volumes
- *Hard Disk Installer* - formats and initializes the hard disk

Tests Run on the Apple II

Tests for the Hard Disk 20SC Disk Drive, the program that is used to test Hard Disk 20SC with the Apple IIe or IIGS, includes a mechanism test, an extended mechanism test, a random read test, a nondestructive read-write test, and a full scan. This test program is contained on the *Apple II SCSI Diagnostic* diskette.

❑ MACINTOSH HARD DISK DRIVE DIAGNOSTIC

Introduction

The *Macintosh Hard Disk Drive Diagnostic* diskette is used to test the Hard Disk 20 and all internal and external SCSI hard disk drives. (For instructions on testing the Hard Disk 20, refer to the *Hard Disk 20 Technical Procedures*, Section 2, Diagnostics.)

Materials Required

Known-good Macintosh Plus, Macintosh SE, or Macintosh II
Known-good *Macintosh Hard Disk Drive Diagnostic* diskette (Version 4.0 or higher)
External or internal SCSI hard disk to be tested

IMPORTANT: *The diagnostic will not run correctly with a SCSI loopback card installed.*

Running the Test

* 1. If you are testing an external SCSI hard disk, connect the SCSI hard disk to be tested to the SCSI port of the Macintosh Plus, Macintosh SE, or Macintosh II.

* 2. Record the SCSI select number of the external hard disk. Make sure the SCSI select switch of the external drive is set at a number between 0 and 6.

Note: The SCSI select number of the Macintosh SE or Macintosh II **internal** hard disk is pre-set at 0, so when using this system to test an external SCSI drive, designate a SCSI select number between 1 and 6 for the external drive.

* 3. Power on the external SCSI hard disk.

4. Insert the *Hard Disk Drive Diagnostic* diskette in the internal floppy drive and turn on the Macintosh. The desktop will appear with the *Hard Disk Drive Diagnostic* diskette icon in the upper right hand corner.

5. Double-click on the diskette icon.

* **Steps for the external SCSI hard disks only.**

6. Double-click on the **Hard Disk Drive Diagnostic** test icon. The test window will appear.

7. The type of drive to be tested is shown in the title bar of the test window (the default is **Hard Disk 20**). Choose **Hard Disk 20SC, 40SC, 80SC** from the **Drive** menu.

8. From the test window, click the appropriate button to select:

   - The short test: This test takes from 30 to 90 minutes, depending on the storage capacity of the hard disk.

   - The extended overnight test (20 iterations of the short test): This test is especially useful for detecting intermittent failures.

9. Now click the **Start** button. When the SCSI select window appears, click on the SCSI select number of the drive to be tested, then click **OK**.

   The diagnostic will now go through the various tests. The **Notes** box at the bottom of the window will display the progress of the test.

   You may stop the test at any time by clicking the **Stop** button. If you click on the **Pause** button, the test will pause until you click on the **Continue** button.

   At the end of the test, a dialog box will give you pass/fail information for the drive tested. Click **OK** to return to the test window.

   The **Erase Disk** option from the **Utilities** menu will erase (but not reinitialize) the hard disk.

   You may quit the *Hard Disk Drive Diagnostic* application at any time (if the test is not running) by choosing **Quit** from the **File** menu.

❑ APPLE II SCSI DIAGNOSTIC

General Information

This section describes procedures for testing the Hard Disk 20SC **only** using the *Apple II SCSI Diagnostic* diskette, which will run only on the Apple IIGS or IIe. (You cannot test the larger hard disks from the Apple II family computers.)

With this diagnostic, you can choose which tests you wish to run and specify their sequence. You can also run a continuous test and keep a record of any error codes that occur. Such a record can be especially valuable when you are attempting to pinpoint the cause of intermittent failures.

The diagnostic takes 40 to 45 minutes to run one iteration of all available tests for the Hard Disk 20SC —or longer if the hard disk is damaged.

Things to Remember

Read the items below **before** you run the tests.

1. Find out if the customer has backed up the files. If not, you may try retrieving the data with the *System Utilities* diskette. If this attempt fails, notify the customer that the data cannot be saved.

2. **Make a backup diagnostic diskette before beginning!** When testing a defective SCSI Interface Card or Hard Disk 20SC, it is possible to erase or damage a section of the diagnostic diskette. (The *System Utilities* diskette is used for making a backup copy. Follow the instructions provided with the *System Utilities*.)

3. **Always run the diagnostics on the SCSI Interface Card first!** (Refer to "Diagnostics" in Section 5, SCSI Interface Card, under this tab.)

CAUTION: *A damaged Hard Disk 20SC can damage the SCSI Interface Card. On completion of the Hard Disk 20SC tests, regardless of the result, retest the SCSI Interface Card. For additional information, refer to the Apple II portion of Section 4, Troubleshooting.*

---

4. This diagnostic looks for hardware errors (which are repaired by module exchange) and software errors (which can usually be corrected by the diagnostic). When the diagnostic locates a software error, it will "repair" it. Tell the customer that this process may cause some data to be unreadable.

5. The test will work on the unenhanced Apple IIe but the screen displays will be distorted. This is caused by the use of MouseText characters in the program, which are not available on the unenhanced Apple IIe.

6. When the Hard Disk 20SC is powered on, the drive whirs. After 5 to 20 seconds, you will hear a signal noise, indicating that the drive is ready.

Materials Required

Apple II SCSI Diagnostic diskette
SCSI Interface Card
Hard Disk 20SC to be tested
Apple IIGS with known-good Apple 5.25 Drive or UniDisk
or
Apple IIe with known-good UniDisk and Extended 80 Column Card
UniDisk Controller Card (if using UniDisk)

How to Make Selections

As you read the menu descriptions in the next section, keep in mind the following general rules for making menu selections:

1. To make a selection, type the letter of the menu item you wish, or use the arrow keys to highlight the name. Then press <Return>.

   As you make your selections on the **Choose Tests** menu, numbers will appear beside the selected tests that indicate the running order of the tests.

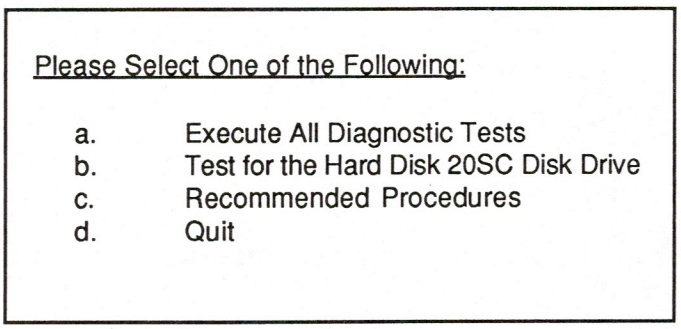
2. Type the letter of any item you wish to deselect, or use the arrow keys to highlight the name. Then press the <Delete> key. <Open-Apple> and <Delete> will delete all selections.

   As you make deselections from the **Choose Tests** menu, the numbers that indicate the running order of the tests are corrected automatically.

3. To access the Help Screen, hold down the <Open-Apple> and <Shift> keys and type ?.

Test Selection Menu

The *Apple II SCSI Diagnostic* Test Selection Menu is shown below.



Tests for the Apple II SCSI Interface Card - Brings up the test menu for the SCSI interface card. (Refer to Section 5, SCSI Interface Card, for further information.)

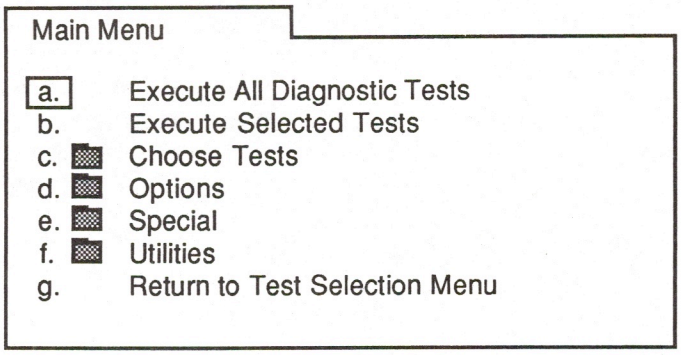
Tests for the Hard Disk 20SC Disk Drive - Brings up the test menu for the Hard Disk 20SC.

Recommended Procedures - Lists the sequence in which the diagnostics should be performed.

Quit - Displays a message to reboot the system.

Tests for the Hard Disk 20SC Disk Drive

When **Tests for the Hard Disk 20SC Disk Drive** is selected, the following Main Menu will appear:



Execute All Diagnostic Tests - Runs all tests available for the Hard Disk 20SC.

Execute Selected Tests - Allows you to run only the tests you selected from the **Choose Tests** menu.

Choose Tests - This option is a folder containing all the tests that can be selected for the Hard Disk 20SC.

Options - This option is a folder containing selections that allow you to control how the test(s) are run.

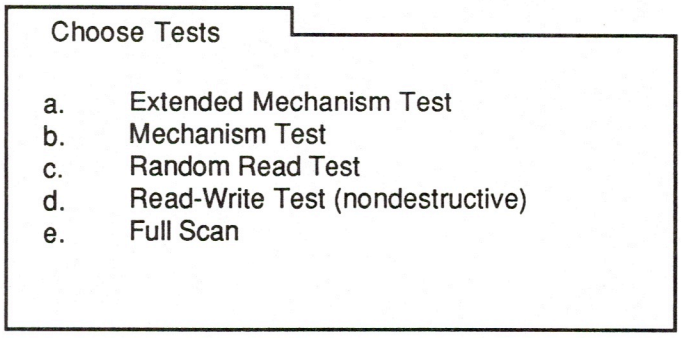
Special - Contains various options for keeping track of errors generated.

Utilities - Contains utilities that will rewrite the boot blocks and reformat the hard disk.

Return to Test Selection Menu - Returns you to the Test Selection Menu.

Choose Tests

The **Choose Tests** folder is shown below:



Note: All the tests listed below will attempt to "repair" any damaged blocks found. If any repairs are performed, this message will appear upon test completion: **NOTE: drive repairs were performed—data may have been lost**.

Extended Mechanism Test - Tests drive head alignment on all disk surfaces.

Mechanism Test - Tests drive head alignment on the top disk surface only.

Random Read Test - Selects random blocks of data to read.

Read/Write Test - Reads and writes to free areas on the hard disk.

Full Scan - Reads the entire hard disk verifying that each block is accessible and undamaged.

IMPORTANT: *If you run the Full Scan test (by itself or with other tests) and see the message:* ***NOTE: drive repairs were performed—data may have been lost****, run the Full Scan test again by itself. If you see the message again, refer to "Full Scan Drive Repairs" at the end of this section.*

Options

When the **Options** folder is open, the following selections appear:

- Loop Tests Until ESC is Pressed
- Continue on Error Until ESC
- ✓ Log Errors To RAM
  (always leave this default selected)

If an option is selected, a check mark appears beside the item. To deselect an option, just select the same option again.

Special

The following are the selections that appear when the **Special** folder is opened.

- Display Error Log - Displays the names of the tests that have failed since the last clearing of the error log (up to 255 names).
- Clear Error Log - Erases the log from RAM.
- Clear Testing Status Line - Clears the iterations and failure counts displayed on the main menu.
- Display Current System Status - Indicates the type of system, the ROM version, and the SCSI card jumper position.

When any of the above items is selected and <Return> is pressed, the action is performed.

Utilities

The following selections appear when the **Utilities** folder is opened:

- Rewrite ProDOS Boot Blocks - Reconstructs the information needed to boot from the Hard Disk 20SC. This should be used only on a Hard Disk 20SC that is used with the Apple IIe or IIGS.
- Reformat Hard Disk 20SC - Erases the Hard Disk 20SC. Choose this only as a last resort, as any data will be lost forever. On completion, you will need to reformat the disk **again** using the *System Utilities* diskette.

When any of the above items is selected and <Return> is pressed, the action is performed.

Running the Diagnostic

The diagnostic can be configured in various ways. All tests can be run in the default sequence, or selected tests can be looped or run in any order you specify.

Standard Test

1. Run the SCSI Interface Card (slot 2) tests before continuing. (Refer to Appendix A, SCSI Interface Card, for instructions.)

2. For the Apple IIGS only, enter the Control Panel **before** booting the diagnostic. (To do this, hold down <Option> while you power on the system. Then type 1.) From the Control Panel:

   - The keyboard buffering must be **off**.
   - The SCSI drive port slot designation (slot 2) must say **Your Card**.

3. Insert the *Apple II SCSI Diagnostic* diskette into the 5.25" drive and power on the system. Type the letter b or use the arrows to select **Tests for the Hard Disk 20SC** and press <Return>.

4. Type the letter a or use the arrows to select **Execute All Diagnostic Tests**, and press <Return>.

   If an error is encountered, the testing will stop and a box will appear specifying which test failed.

   If the diagnostic repaired any blocks on the drive, this message will appear: **NOTE: drive repairs were performed—data may have been lost**.

5. To stop the sequence of tests, press <Escape>.

6. On completion, the message **Testing finished** will be displayed. This does not necessarily indicate that the tests have passed. Press <Space> to continue. Then check the error log for test results.

Customized Test

To run a customized test:

1. Run the SCSI Interface Card tests before continuing. (Refer to Appendix A, SCSI Interface Card.)

2. For the Apple IIGS only, enter the Control Panel **before** booting the diagnostic. (To do this, hold down <Option> while you power on the system. Then type 1.) From the Control Panel:

   - The keyboard buffering must be **off**.

   - The SCSI drive port slot designation (slot 2) must say **Your Card**.

3. Insert the *Apple II SCSI Diagnostic* diskette in the 5.25" drive and power on the system. Type the letter b or use the arrows to select **Tests for the Hard Disk 20SC Disk Drive** and press <Return>.

4. Type the letter c or use the arrows to select **Choose Tests**, and press <Return>. Then select the tests you wish to run and press <Return>.

5. On completion, return to the main menu, select **Execute Selected Tests,** and press <Return>.

   If the diagnostic repaired any blocks on the drive, this message will appear: **NOTE: drive repairs were performed—data may have been lost.**

6. To stop the sequence of tests, press <Escape>.

7. On completion, the message **Testing finished** will be displayed. This does not necessarily indicate that the tests have passed. Press <Space> to continue. Then check the error log for test results.

Continuous Test

Follow the steps below to run a continuous (looping) test.

1. From the main menu, select **Options** and press <Return>.

2. From the **Options** menu, select **Loop Tests Until ESC is Pressed** and press <Return>.

   A check mark should appear, indicating that it has been selected.

3. Select **Continue On Error Until ESC** if you want to continue looping regardless of the error until <Escape> is pressed.

   If you do not select this option, the testing will halt when an error is encountered.

4. Errors are recorded in RAM by default. Do not deselect this option or no errors will be recorded.

5. Return to the main menu and select **Execute All Diagnostic Tests** and press <Return>. (Or select desired tests from the **Choose Tests** menu and then choose **Execute Selected Tests**.)

   Depending on your selection in step 3, the tests will run continuously until an error occurs or until <Escape> is pressed. If <Escape> is pressed, testing stops and looping is cancelled.

   You can check for errors after you stop by selecting **Special** and pressing <Return> and then selecting **Display Error Log.**

6. If you are going to run the test again, be sure to clear the error log and the status line before returning to the main menu. If you wish to run a continuous test again, you must go back to the **Options** menu and again select **Loop on Error Until ESC is Pressed**.

Full Scan Drive Repairs

If the Full Scan test returns the message **NOTE: drive repairs were performed—data may have been lost**, the test must be repeated since version 1.0 of the diagnostic only repairs and reports the **first** damaged blocks it finds. If you see this message, follow the steps below:

1. Retry **just** the Full Scan test, but this time with the looping option selected from the **Options** menu.

2. Allow the test to run for an extended period of time (preferably overnight).

3. After the extended run, press <Escape> to stop the testing.

4. Regardless of whether or not the repair message appeared after the extended test was halted, **turn off** the looping option and run **just** the Full Scan test one last time.

5. If the repair message **does not** appear again, the drive can be considered operational with regard to this test.

   If the repair message **does** appear again, repeat the sequence of an extended looped full scan test, followed by one unlooped full scan test (as above) until no repair message occurs.

Apple Technical Procedures

SCSI Hard Disk Drives

Section 4 – Troubleshooting

❑ CONTENTS

4.2 Introduction
4.3 Things to Remember
4.4 Macintosh — SCSI Hard Disk Drives
4.5 Flowchart 1
4.6 Apple IIe/IIGS — Hard Disk 20SC
4.7 Flowchart 2A
4.9 Flowchart 2B

❑ INTRODUCTION

This troubleshooting guide is divided into two sections:

- The first section describes troubleshooting procedures for SCSI Hard Disk Drives that are used with the Macintosh Plus, Macintosh SE, or Macintosh II.

- The second section describes troubleshooting procedures for a Hard Disk 20SC that is used with an Apple IIe or IIGS.

Each section contains a list of materials required, one or more flowcharts, and a table of notes for each flowchart.

"Things To Remember" covers information you need to troubleshoot the SCSI Hard Disk Drives effectively. After you have read the information, turn to the appropriate flowcharts.

❑ THINGS TO REMEMBER

1. Be sure to stress to your customers the importance of backing up all files onto diskettes or tape. If you must reinitialize a SCSI hard disk drive, everything stored on it will be removed permanently—a very good reason for keeping current backup files!

2. Verify which system (Macintosh or Apple II) the customer is using with the SCSI hard disk drive, and test the hard disk only on a similar system. (You may lose data if you use a different system.)

3. Be sure to use appropriate **known-good software** and a **known-good system** when troubleshooting.

4. After installing a hard disk drive assembly, you will have to initialize the new disk and then copy the customer's backed-up files onto it.

5. When you return a SCSI hard disk drive assembly for exchange, it must be shipped in Apple-approved packaging.

6. **The SCSI hard disk LED is *off* when the drive is ready**. If the LED on the hard disk stays on or keeps flashing, the HDA assembly is probably bad.

7. The SCSI hard disk assembly service modules come with resistor packs, which are necessary for correct **internal** drive functioning. The resistor packs must be removed for proper **external** drive operation. Therefore, if the drive is sluggish or inoperable, check for the presence or absence of the resistor packs, as appropriate.

❑ MACINTOSH — SCSI HARD DISK DRIVES

Materials Required

Macintosh Plus, Macintosh SE, or Macintosh II
MacTest, *MacTest SE*, or *MacTest II* diagnostic diskette
Macintosh Hard Disk Drive Diagnostic diskette
DIN-8 Serial Port Cable (for *MacTest SE* or *MacTest II)*
SCSI Loopback Card (modified for Macintosh SE or II)
SCSI Hard Disk Drive

Flowchart 1 Notes

1. This step eliminates the Macintosh SCSI circuitry as the problem. (Refer to Diagnostics in the *Macintosh/ Macintosh Plus*, *Macintosh SE*, or *Macintosh II Technical Procedures.)* The diagnostic does not find bad SCSI connectors on the Macintosh board. To rule out this possibility, perform a visual inspection of the pins and solder joints on the SCSI connectors.

* 2. Remove the top cover of the SCSI case (see Section 2, Take-Apart). Plug in the SCSI hard disk power cord, connect the hard disk to the Macintosh, and power on the hard disk. (Do not turn on the Macintosh.)

* 3. You should hear the hard disk whir. Look into the open SCSI case and make sure the fan is working.

* 4. The LED is **on** when the hard disk is operating, and **off** when the heads are not moving. If the light is on after 15-20 seconds, the HDA is probably bad.

5. Refer to the Diagnostics sections in the *Macintosh/ Macintosh Plus*, *Macintosh SE*, or *Macintosh II Technical Procedures.*

6. *Disk First Aid* is a program that attempts to repair Macintosh HFS file structures on the SCSI hard disk. (Refer to Section 1, Basics, for more information.)

7. If the customer has not already done so, back up as many files as possible before continuing.

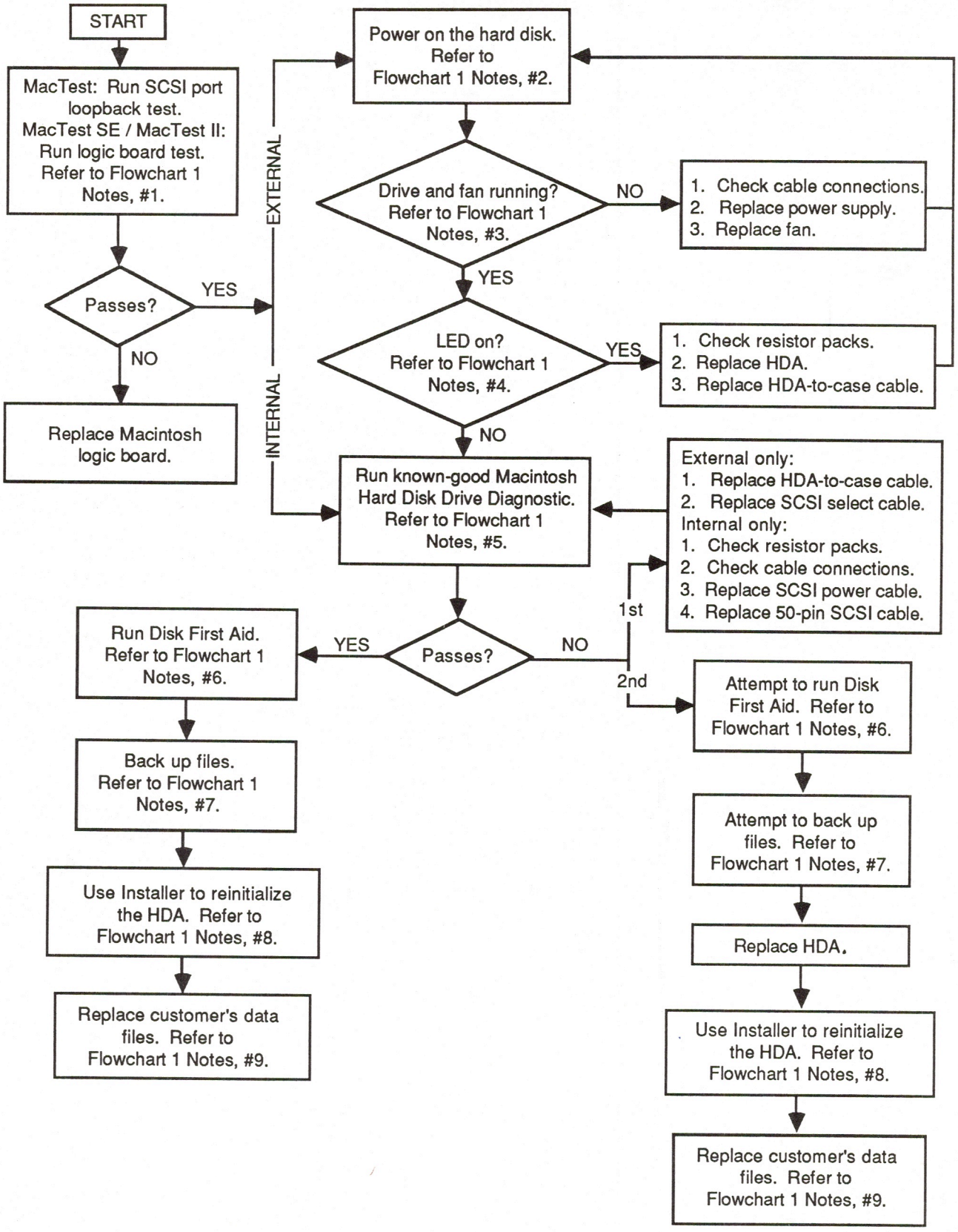
8. Use the Hard Disk Installer program to reinitialize the hard disk. (Refer to Section 1, Basics.)

9. After initializing the SCSI hard disk, recopy the customer's backed-up data onto the hard disk.

* **Steps for the external SCSI hard disks only.**

FLOWCHART 1

Macintosh - SCSI Hard Disk Drives



❑APPLE IIe/IIGS — HARD DISK 20SC

Materials Required

Known-good Apple IIe or IIGS
Known-good *Apple II SCSI Diagnostic* diskette
Known-good SCSI Interface Card
Known-good SCSI Loopback Card
Hard Disk 20SC to be tested

Flowchart 2A Notes

1. Always test the SCSI Interface Card by itself before testing the Hard Disk 20SC. (Refer to Section 5, SCSI Interface Card, for specific information.)

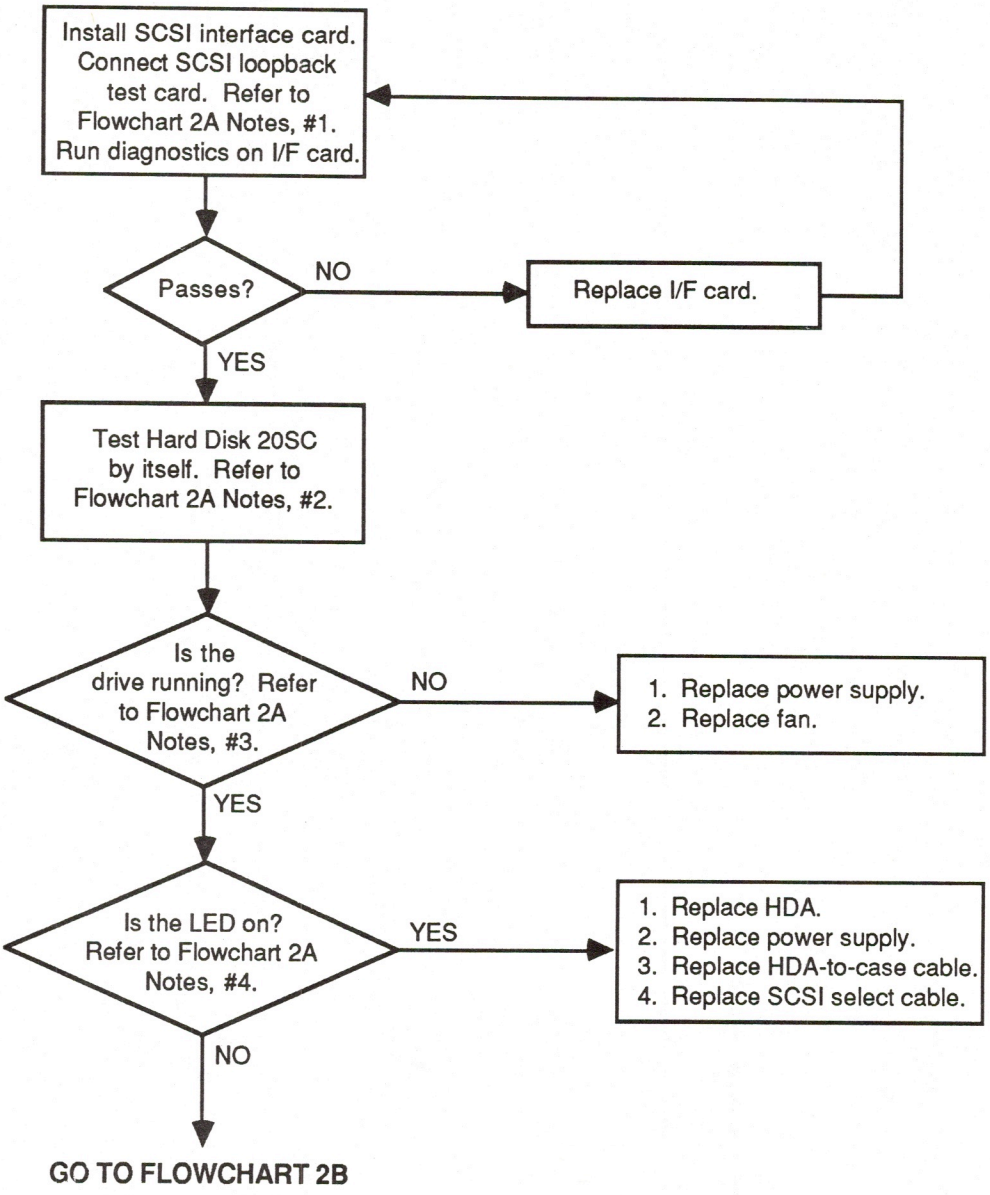
   Note: The firmware (ROM) presently installed on the SCSI Interface Card cannot handle programs that enable interrupts during access of the Hard Disk 20SC. The result is an unidentifiable system crash on the Apple IIGS. In most cases, the SCSI Interface Card would pass the diagnostic tests. For more information refer to Section 5, SCSI Interface Card.

2. Remove the top cover of the Hard Disk 20SC (see Section 2, Take-Apart). Connect the power cord of the Hard Disk 20SC to a wall outlet and power on the unit. Do not connect the drive to the interface card until instructed to do so.

3. You should hear the hard disk whir. Look into the open Hard Disk 20SC case and make sure the fan is working.

4. The LED is **on** *only* when the hard disk is being accessed. It is **off** when the heads are not moving. If the light is still on after 15-20 seconds, the hard disk assembly is probably bad.

FLOWCHART 2A
Apple IIe / IIGS - Hard Disk 20SC



Flowchart 2B Notes

1. Power off the computer and the Hard Disk 20SC. Connect the Hard Disk 20SC to the SCSI Interface Card.

2. Insert the *System Utilities* diskette (2.1.1 version or higher) into drive 1. Select **Identify and Catalog a Disk**. Enter either the slot and drive number or the volume name for the Hard Disk 20SC. A catalog should appear for the Hard Disk 20SC.

3. Use the **Rewrite Boot Blocks** option provided on the *Apple II SCSI Diagnostic* diskette in the **Utilities** menu. Refer to Section 3, Diagnostics.

4. You **must** reformat the Hard Disk 20SC twice, in the following order:

   a) Use the **Reformat** option from the **Utilities** menu of the *Apple II SCSI Diagnostic* diskette. (Refer to Section 3, Diagnostics.)

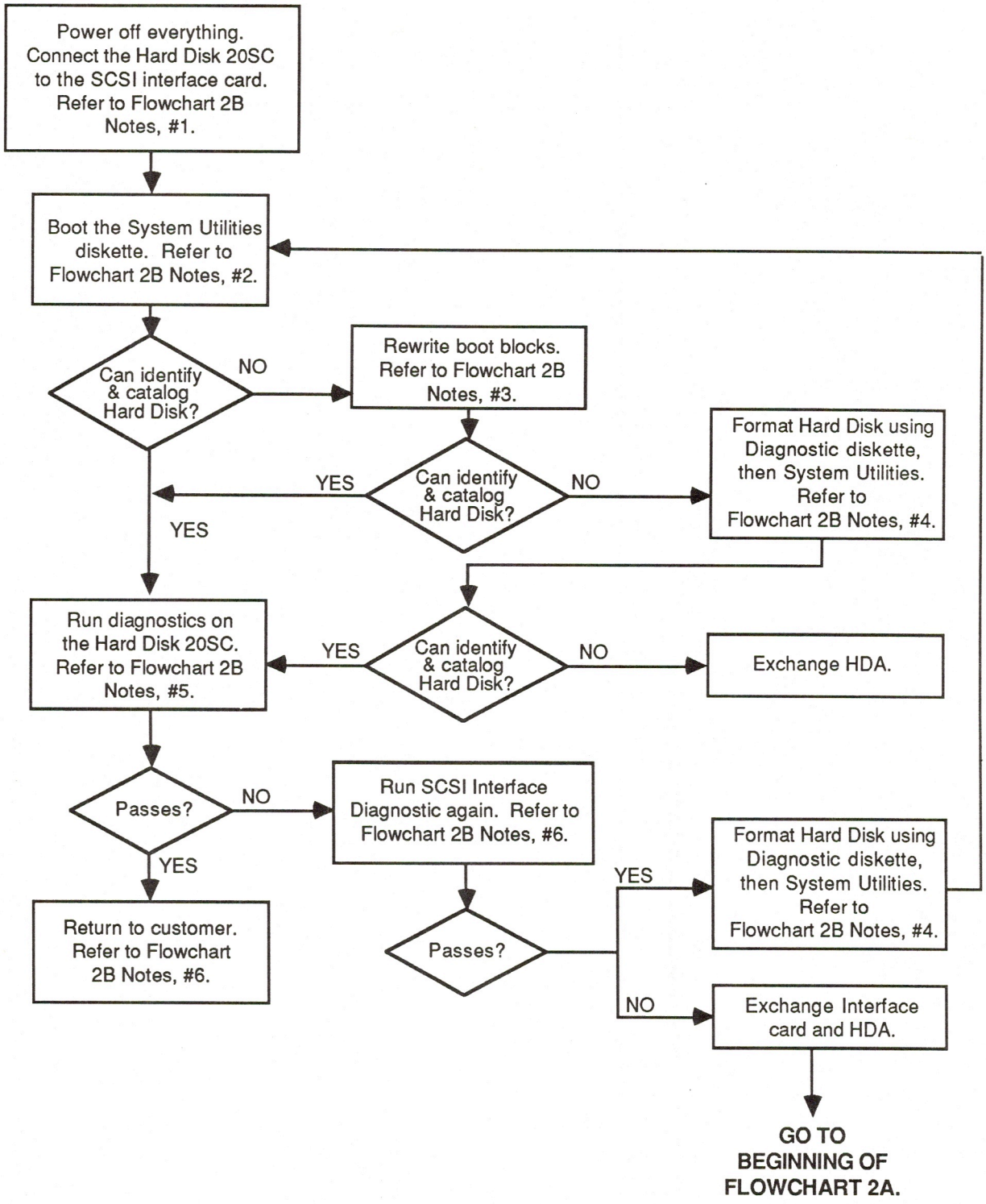
   b) Use the *System Utilities* diskette (version 2.1 or higher).

5. Before you run the diagnostic, notify the customer that the repair process included in the diagnostic software may cause some data to be unreadable. If the message **Minor repairs were performed—data may have been lost** is displayed, software errors were encountered and the diagnostic has corrected them.

6. Refer to Section 5, SCSI Interface Card, for more information.

7. If you exchange the hard disk assembly, tell the customer that he must reinstall all his applications and data files (if they were backed up).

FLOWCHART 2B
Apple IIe / IIGS - Hard Disk 20SC



Apple Technical Procedures

SCSI Hard Disk Drives

Section 5 – SCSI Interface Card

❑ CONTENTS

5.2 Introduction
5.2 Setting Priorities Among Devices
5.2 Priority Numbers
5.3 Rules for Configuring Devices
5.4 Diagnostics
5.4 General Information
5.4 Things to Remember
5.5 Materials Required
5.6 How to Make Selections
5.7 Test Selection Menu
5.8 Tests for the Apple II SCSI Interface
5.9 Choose Tests
5.9 Options
5.9 Special
5.10 Running the Diagnostic
5.13 SCSI Interface Card ROM Upgrade
5.13 Introduction
5.13 Installation

❑ INTRODUCTION

The SCSI Interface Card allows computers of the Apple II family to communicate with peripheral devices that use the Small Computer System Interface (SCSI) standard. The card is inserted into a slot in the Apple IIe or Apple IIGS and connected to a Hard Disk 20SC, a tape backup, or any other SCSI product. The SCSI Interface Card is supported by ProDOS and ProDOS-based applications.

❑ SETTING PRIORITIES AMONG DEVICES

Priority Numbers

A *priority number* is set for each SCSI device in a system, and the priority number sequence controls the accessing of all the SCSI devices that are connected. A separate priority number must be assigned to every SCSI device: one device, one number. This prevents two devices from sending data at the same time, which could damage files already saved. With the Apple II computers, the device with the highest priority number (7) is the one that is accessed first.

You set the priority of SCSI devices by some physical mechanism (which varies among devices). For exact instructions, consult the owner's manual of the specific peripheral you are connecting to the SCSI Interface Card.

The computer should be assigned top priority. Make sure the SCSI card is set up as shown in Figure 1. The jumper (connector) should be on pins 8 and 9 for top priority (see Figure 1).

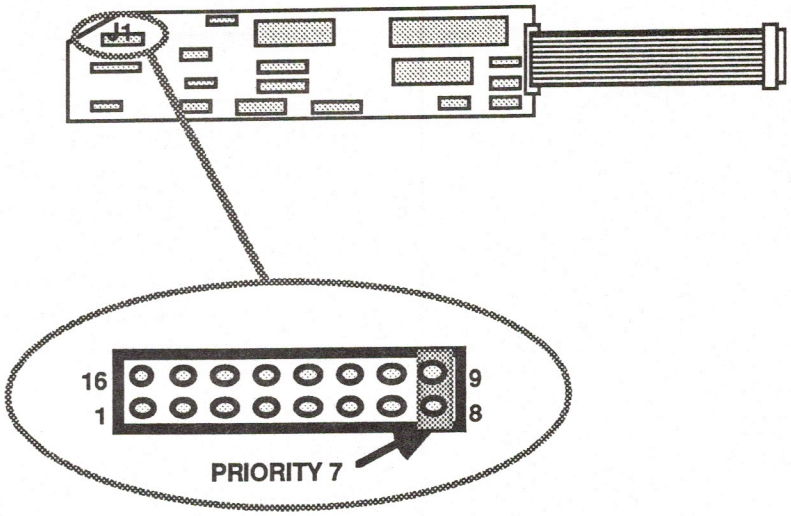


FIGURE 1

Rules for Configuring Devices

1. Connect the SCSI system cable to the computer's SCSI Interface Card. **Never connect any other cable to that interface card!**

2. Make sure all the peripheral SCSI devices are daisy-chained to the SCSI Interface Card and are turned on. Make sure each connection is secure.

3. Be sure each SCSI device has its own assigned priority: 6, 5, 4, 3, 2, 1, or 0. Priority 7 is highest (reserved for the CPU); 0 is lowest.

4. The SCSI interface card must be in the highest slot to boot from the SCSI device automatically.

❑ DIAGNOSTICS

General Information

This section describes the procedures for using the *Apple II SCSI Diagnostic* diskette. With this diagnostic, you can choose which tests you wish to run, and specify their sequence. You can also run a continuous test and keep a record of any error codes that occur. This record can be especially valuable when you are attempting to pinpoint the cause of intermittent failures.

Things to Remember

1. **Make a backup diagnostic diskette before beginning!** When testing a defective SCSI Interface Card or Hard Disk 20SC, it is possible to erase or damage a section of the test diskette. (The *System Utilities* diskette is used for making a backup copy. Follow the instructions provided with the *System Utilities.*)

2. **The SCSI Interface Card must be in slot 2.**

3. If you are running the diagnostic on an Apple IIe, you must have an Apple Extended 80 Column Card installed.

4. You must set up the Control Panel correctly before connecting the SCSI Loopback Card. To do this, hold down the <Option> key and power on the system. Check the Control Panel to make sure the keyboard is set to **No buffering** and that slot 2 is set for **Your Card**.

5. If you are going to run a looping test that requires a loopback card, you must have the loopback card installed. If you do not, an alert box will tell you to power off, install the card, and restart the system.

6. The test will work on the unenhanced Apple IIe, but the screen displays will be distorted. This is caused by the use of MouseText characters in the program; these characters are not available on the unenhanced Apple IIe.

Materials Required

Apple II SCSI Diagnostic diskette
Loopback cable for game port
SCSI loopback card
Extended 80 Column Card for the Apple IIe
Known-good Apple 5.25 Drive (or UniDisk, DuoDisk, or Disk II)
Apple IIGS or Apple IIe (enhanced or unenhanced)
SCSI Interface Card to be tested

Loopback Card

The cable used to connect the SCSI loopback test card to the mouse port (or game I/O port on the Apple IIe) **must** have wire #1 notched (see below) to be fully compatible with the SCSI Interface Card. Once the cable is notched, it will work on either the Apple II family or the Macintosh family of computers.

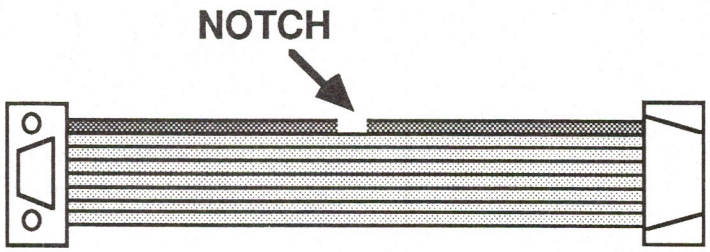


FIGURE 2

If the cable has **not** been notched, you must notch it by following the procedure below.

1. Locate the colored (usually red) wire on one edge of the ribbon cable (see Figure 2).

2. Cut a small piece, about 1/8 inch, from the colored wire. Be careful not to cut any of the other wires in the ribbon cable.

Installing Loopback Card

To install the loopback card, connect the end of the notched DB-9 cable to the mouse port on the Apple IIGS or the game I/O port on the Apple IIe. Connect the other end of the notched cable to the connector on the loopback card that is labeled "to mouse unit." Connect the other cable on the loopback card to the SCSI Interface Card (which is in slot 2).

How to Make Selections

As you read the menu descriptions in the next section, keep in mind the following general rules for making menu selections:

1. To make a selection, type the letter of the menu item you wish, or use the arrow keys to highlight the name. Then press <Return>.

   As you make your selections on the **Choose Tests** menu, numbers will appear beside the selected tests that indicate the running order of the tests.

2. Type the letter of any item you wish to deselect, or use the arrow keys to highlight the name. Then press the <Delete> key. <Open-Apple> and <Delete> will delete all selections.

   As you make deselections from the **Choose Tests** menu, the numbers that indicate the running order of the tests are corrected automatically.

3. To access the Help Screen, hold down the <Open-Apple> and <Shift> keys and type ?.

4. If you must press a key to start the next test, use the <Spacebar>, not the <Escape> key. (Pressing <Escape> stops the testing.)

Test Selection Menu

The *Apple II SCSI Diagnostic* Test Selection Menu is shown below.

Please Select One of the Following:

a. Tests for the Apple II SCSI Interface Card
b. Tests for the Hard Disk 20SC Disk Drive
c. Recommended Procedures
d. Quit

Tests for the Apple II SCSI Interface Card - Brings up the menu containing the tests for the interface card.

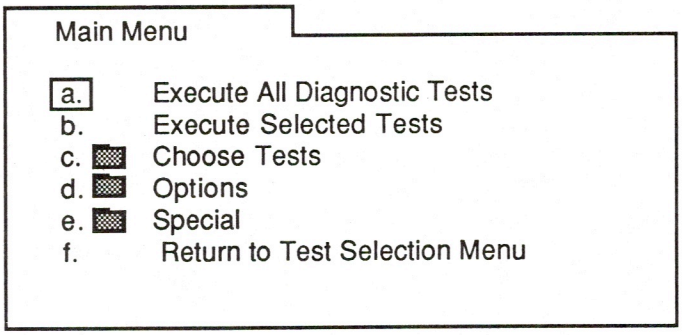
Tests for the Hard Disk 20SC Disk Drive - Brings up the menu containing the tests for the hard disk (refer to Section 3, Diagnostics, for this information).

Recommended Procedures - Lists the sequence in which the diagnostics should be performed.

Quit - Displays a message to reboot the system.

Tests for the Apple II SCSI Interface

When **Tests for the Apple II SCSI Interface Card** is selected, the following Main Menu will appear:



Execute All Diagnostic Tests - Runs all tests available for the SCSI Interface Card.

Execute Selected Tests - Allows you to run only the tests you indicate.

Choose Tests - This option is a folder that contains all the tests that can be selected for the Apple SCSI Interface Card.

Options - Contains various selections that allow you to control how the test(s) are run.

Special - Contains various options for keeping track of errors generated.

Return to Test Selection Menu - Returns you to the Test Selection Menu.

Choose Tests

The **Choose Tests** folder contains the following tests:

RAM Tests - Verifies that the RAM on the card is good.

ROM Tests - Verifies that the ROM on the card is good.

Bus Tests - Verifies that all bus lines are functional (requires SCSI loopback card).

SCSI Chip Tests - Verifies that control signals are functional (requires SCSI loopback card).

Options

When the **Options** folder is open, the following list of selections appears on the screen.

- Loop Tests Until Esc
- Continue on Error Until Esc
- Log Errors to RAM

If an option is selected, a check mark appears beside the item. To deselect an option, just select the same option again.

Special

The following selections appear when the **Special** folder is opened.

- Display Error Log - Displays the name of the test being run when an error was encountered on the screen.
- Clear Error Log - Erases the log from RAM.
- Clear Testing Status Line - Clears the iterations and failure counts displayed.
- Display Current System Status - Indicates the type of system, the ROM version, and the position of the jumper pin on the SCSI Interface Card.

When any of the above items is selected and <Return> is pressed, the action is performed.

Running the Diagnostic

The diagnostic can be configured in various ways. All tests can be run in the default sequence, or selected tests can be looped or run in an order you specify.

Note: There may be a 15-to-20-second delay when booting the *Apple II SCSI Diagnostic*.

IMPORTANT: *You must set the Control Panel before connecting the SCSI Loopback Card to the interface. Hold down the <Option> key and power on the system. Verify that the keyboard is set to* ***No buffering*** *and that slot 2 is set for* ***Your Card.***

Standard Test

1. Install the loopback card. Connect the large cable to the SCSI Interface Card (which is in slot 2) and the DB-9 cable to the mouse port on the Apple IIGS or the game I/O on the Apple IIe. Verify that the other end of the DB-9 cable is connected to the SCSI loopback card connector that is labeled "to mouse conn."

2. Insert the *Apple II SCSI Diagnostic* diskette and power on the system. Type the letter a or use the arrows to select **Tests for the Apple II SCSI Interface Card**, and press <Return>.

3. Type the letter a or use the arrows to select **Execute All Diagnostic Tests**, and press <Return>. If an error is encountered, the testing will stop and a box will appear specifying which test failed.

4. On completion, the message **Testing finished** will be displayed.

Customized Test

1. Insert the *Apple II SCSI Diagnostic* diskette and power on the system. Type the letter a or use the arrows to select **Tests for the Apple II SCSI Interface Card**, and press <Return>.

2. Type the letter c or use the arrows to select **Choose Tests**, and press <Return>. Then highlight the tests you wish to run and press <Return>.

   If you wish to deselect a test, use the letters or arrows to select the test and press the <Delete> key.

3. On completion, return to the main menu, select **Execute Selected Tests,** and press <Return>.

   If an error is encountered, the testing will stop and a box will appear specifying which test failed.

4. On completion, the message **Testing finished** will be displayed.

Continuous Test

A continuous (looping) test is available. Select the tests you wish to loop by following the instructions under "Customized Test" (see above). Follow the steps below to run a continuous test.

> ***Note:*** When you stop a continuous test, the looping function is automatically turned off. You will have to reselect this function from the menu if you wish to run the continuous test again.

1. After you have chosen the tests you want to run, return to the main menu, select **Options**, and press <Return>.

2. From the menu, select **Loop Tests Until Esc** and press <Return>.

   A check mark should appear beside the selection.

3. Select **Continue On Error Until Esc** if you want to continue looping, regardless of errors, until <Escape> is pressed.

   If you do not select this, the testing will halt when an error is encountered.

4. You may record errors to RAM. Select this if you wish to record.

5. Return to the main menu, select **Execute Selected Tests,** and press <Return>.

   The tests will run (depending on your selection in step 3) continuously until an error occurs or until <Escape> is pressed. If <Escape> is pressed, looping is canceled.

   If you press <Escape> to stop the testing, you can then check for errors by selecting **Special** and pressing <Return>.

   Select the video display for a listing of the errors encountered.

6. If you are going to run the test again, be sure to clear the error log and the status line from the **Special** menu before returning to the main menu.

❑ SCSI INTERFACE CARD ROM UPGRADE

Introduction

The firmware (ROM) presently installed on the SCSI Interface Card cannot handle programs that enable interrupts during access of the Hard Disk 20SC. The result is an unidentifiable system crash on the Apple IIGS. The card will pass the diagnostic test, but crashes may occur if both of the following are true:

- The SCSI Interface Card is used with an interrupt-driven program (like AppleTalk).
- The program calls the SCSI Interface Card directly (bypassing ProDOS).

Installation

If crashes occur when using AppleTalk, but the SCSI Interface Card still passes the diagnostics, check the ROM revision. If the ROM at A3 is 341-0112A, upgrade it to the new ROM, 341-0112B.

1. Locate the old ROM (labeled 341-0112A) at coordinate A3 on the interface card (Figure 2, #1).

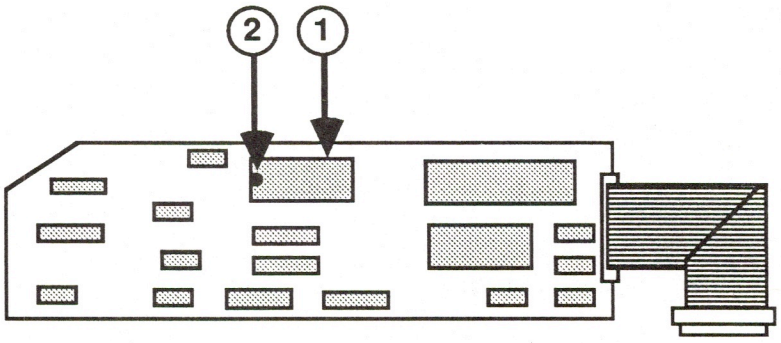


FIGURE 2

2. Remove the ROM with IC extractors. If it is difficult to remove, gently pry both ends up with a jeweler's screwdriver.

3. Position the new ROM (341-0112B) onto the socket. Be sure that the notch on the ROM is facing **away from** the cable on the interface card (Figure 2, #2). Press the ROM firmly into the socket.

4. Run the *Apple II SCSI Diagnostic* to verify the ROM.

Apple Technical Procedures

SCSI Hard Disk Drives

Illustrated Parts List

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IPL.3 Complete Assembly (Figure 1)
IPL.5 SCSI Hard Disk Drives – Hard Disk Assembly (Figure 2)
IPL.7 Hard Disk 20SC – Hard Disk Assembly (Figure 3)
IPL.9 Hard Disk 40SC/80SC – Hard Disk Assembly (Figure 4)
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IPL.12 Service Packaging, 5.25 HDA (Figure 6)
IPL.13 Service Packaging, 3.5 HDA (Figure 7)

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the SCSI hard disk drives, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.

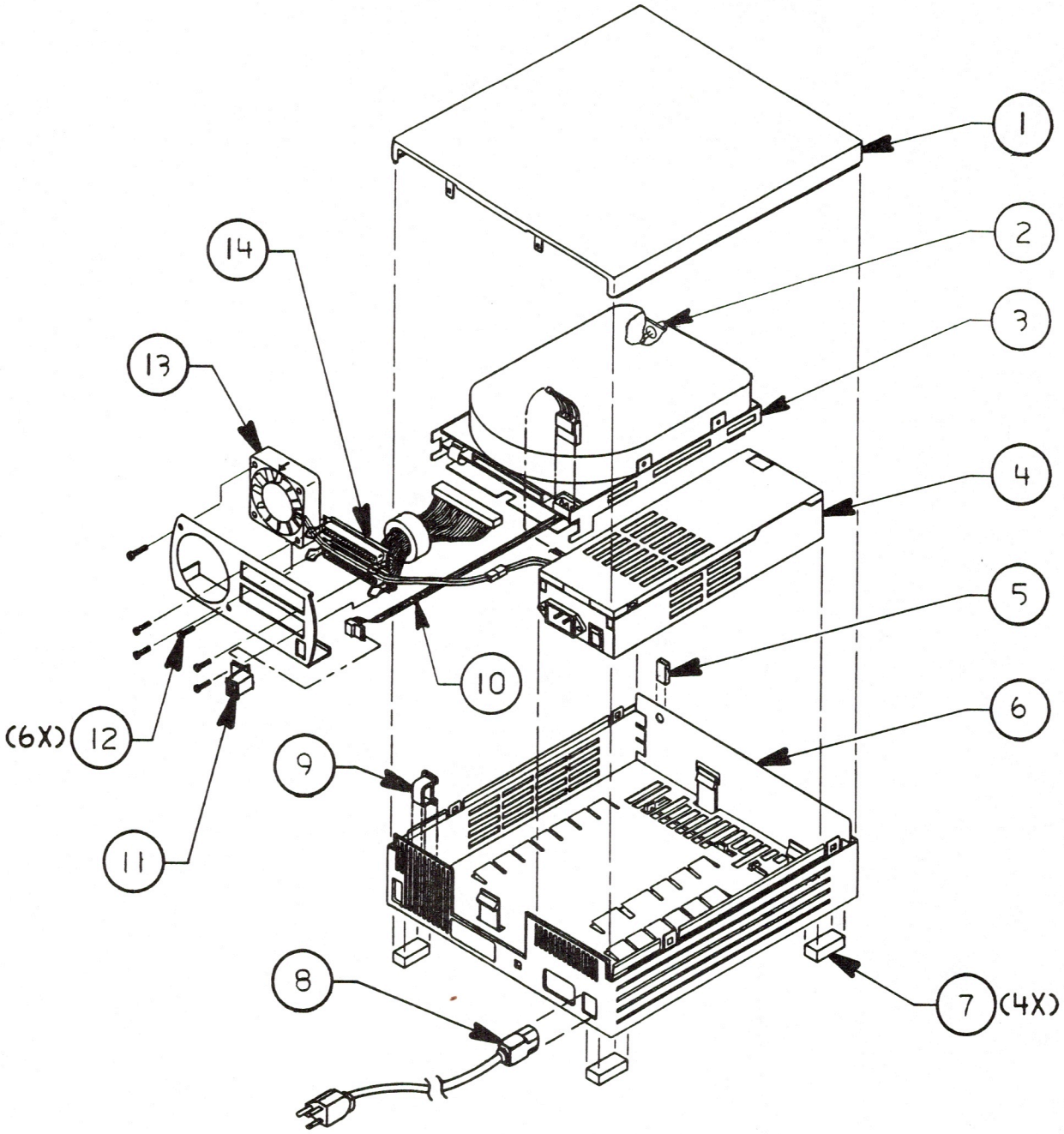


FIGURE 1

❑ SCSI HARD DISK DRIVES – COMPLETE ASSEMBLY (Figure 1)

Item	Part No.	Description
1	630-5258	Case Top Assembly, Beige
	630-5288	Case Top Assembly, Platinum
2	590-0237	LED Cable
3	805-0376	HDA Frame
4	661-0343	Power Supply
5	815-0974	Lens
6	630-5257	Case, Plastic Bottom Assembly 20SC, Beige
	630-5287	Case, Plastic Bottom Assembly 20SC, Platinum
	630-5335	Case, Plastic Bottom Assembly 40SC
	630-5337	Case, Plastic Bottom Assembly 80SC
7	865-0024	Foot, Platinum
8	590-0260	Power Cable, Beige
	590-0380	Power Cable, Smoke
9	815-0975	Security D-Ring, Beige
	815-0985	Security D-Ring, Platinum
10	590-0238	SCSI Device Select Cable
11	705-0045	SCSI Select Switch Assembly
12	462-3100	Screw, M3 x .5 x 6
13	699-0469	Fan
14	590-0235	SCSI Device-to-Case Cable

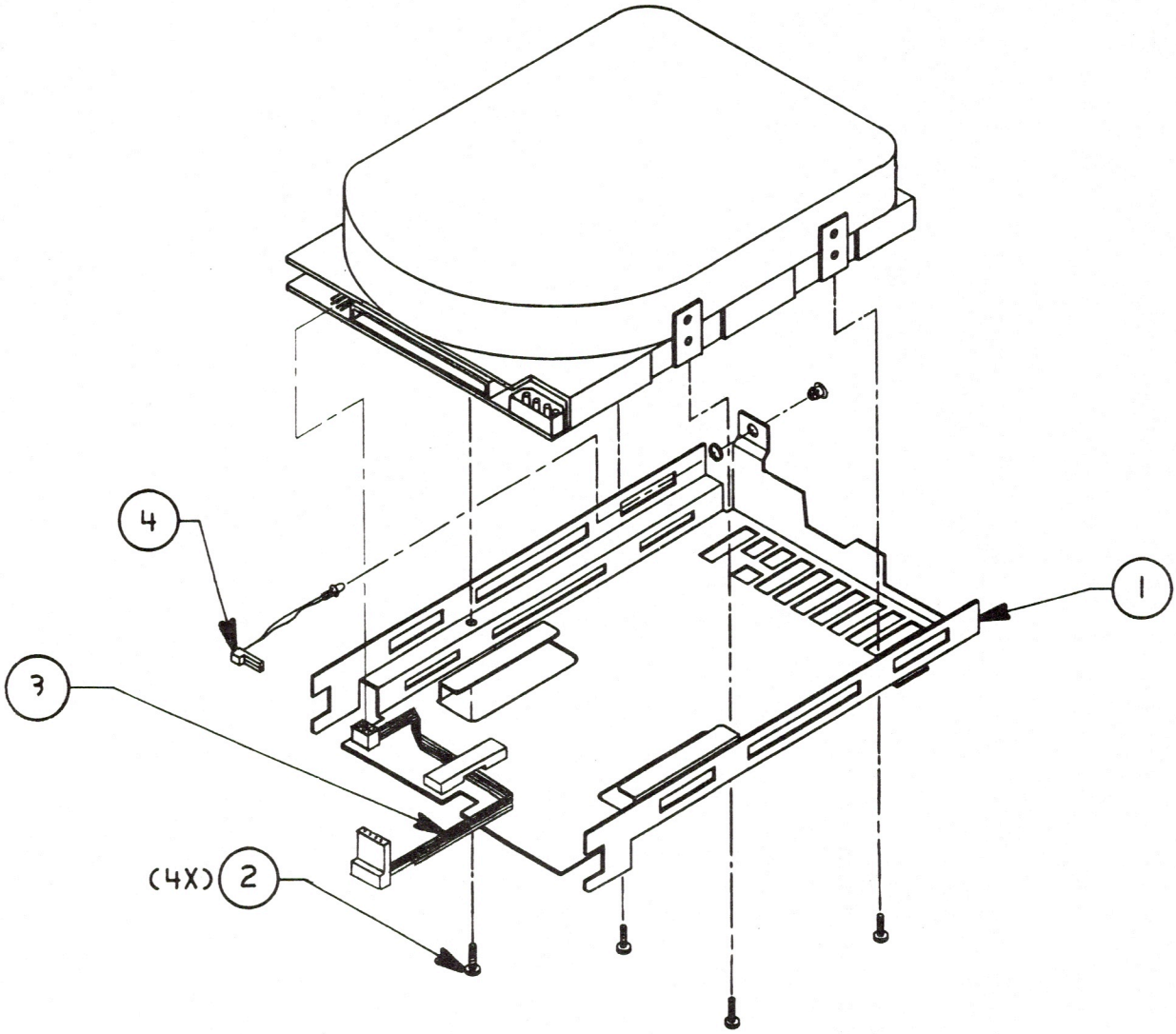


FIGURE 2

❑ SCSI HARD DISK DRIVES – HARD DISK ASSEMBLY (HDA) (Figure 2)

Item	Part No.	Description
-	661-0342	HDA, 5.25 20M, SCSI
1	805-0376	HDA Frame
2	408-1603	Screw, 6-32 x 3/16
3	590-0238	SCSI Select Cable
4	590-0237	LED Cable Assembly

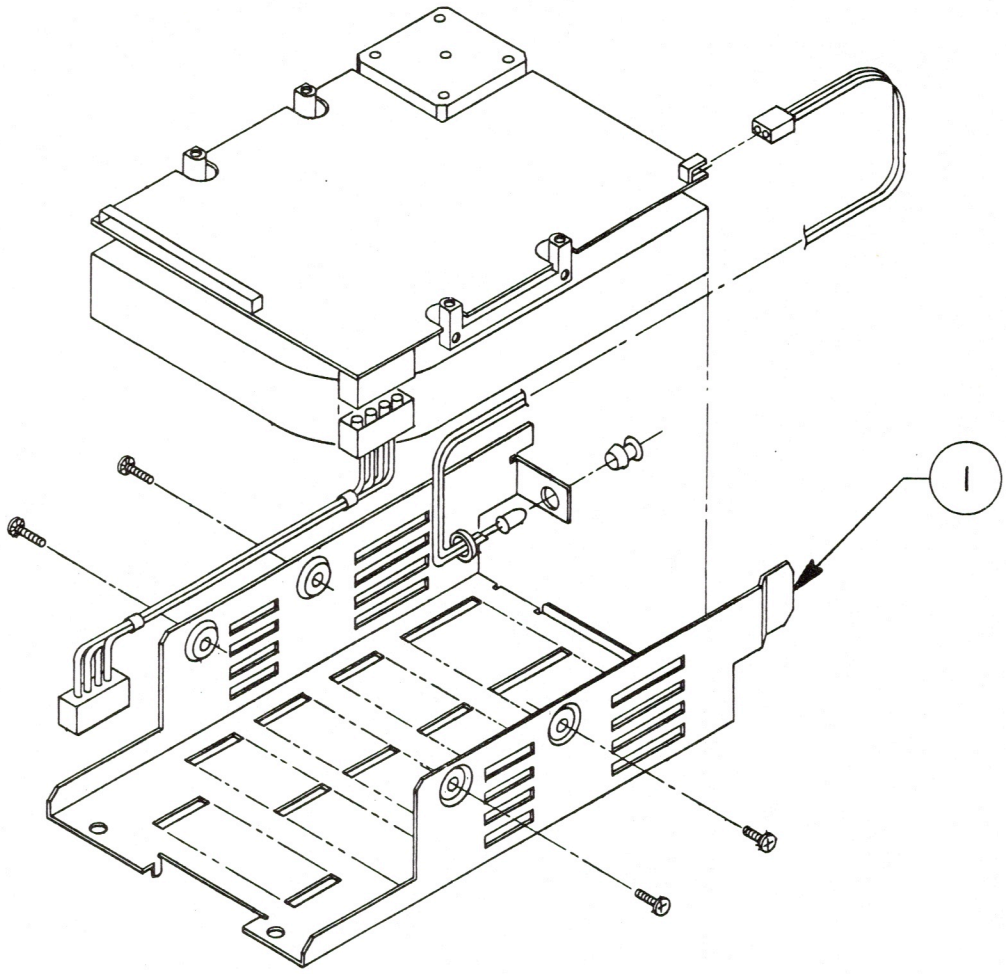


FIGURE 3

❑ HARD DISK 20SC – HARD DISK ASSEMBLY (HDA) (Figure 3)

Item	Part No.	Description
-	661-0373	HDA, 3.5, 20M, SCSI
1	805-5066	Metal Housing, 3.5 HDA

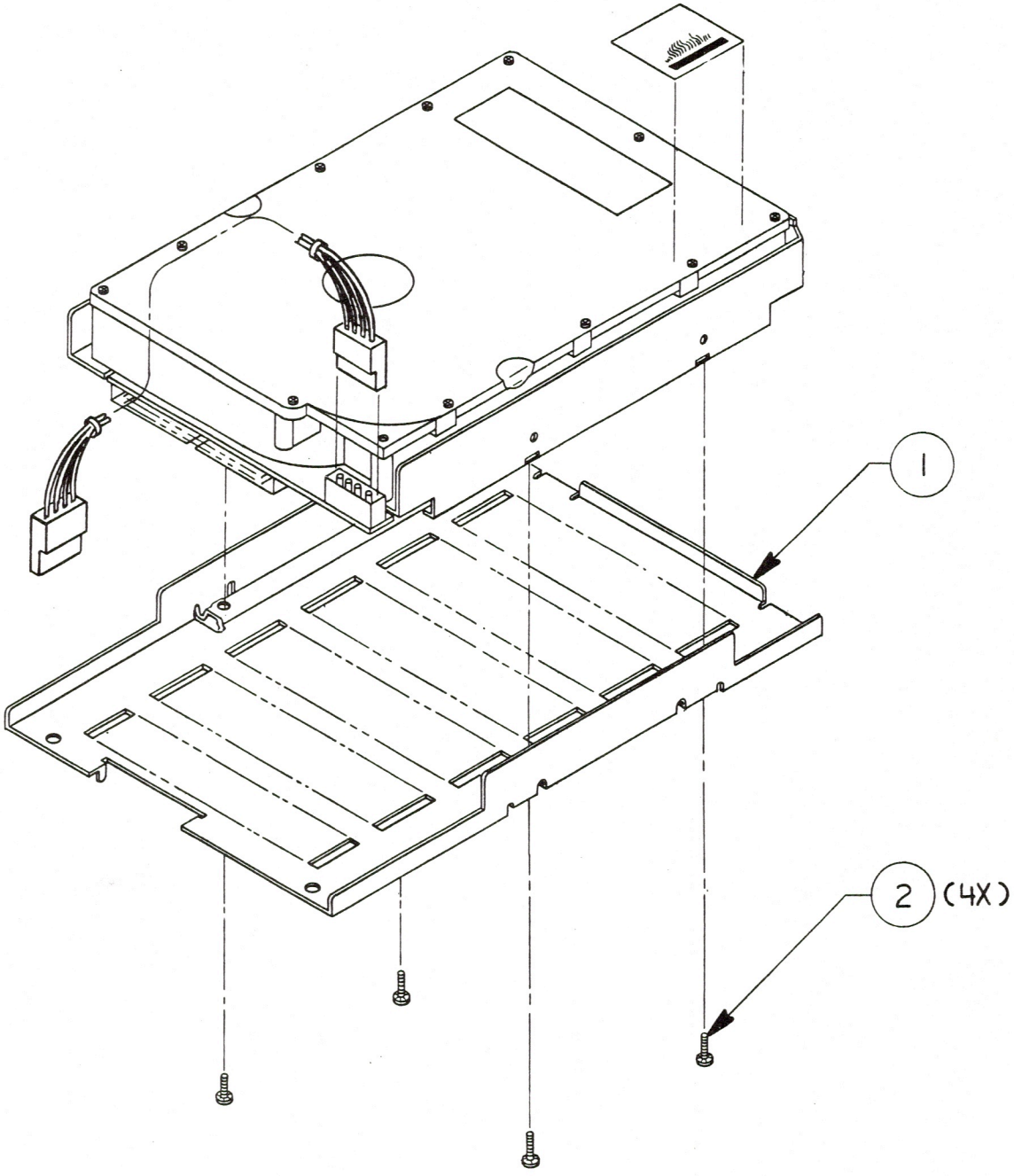


FIGURE 4

❑ HARD DISK 40SC/80SC – HARD DISK ASSEMBLY (HDA) (Figure 4)

Item	Part No.	Description
-	661-0391	HDA, 5.25, 40M, SCSI
-	661-0411	HDA, 3.5 80M, SCSI
1	805-5051	Macintosh II HDA Frame
2	408-1603	Screw, 6-32 x 3/16

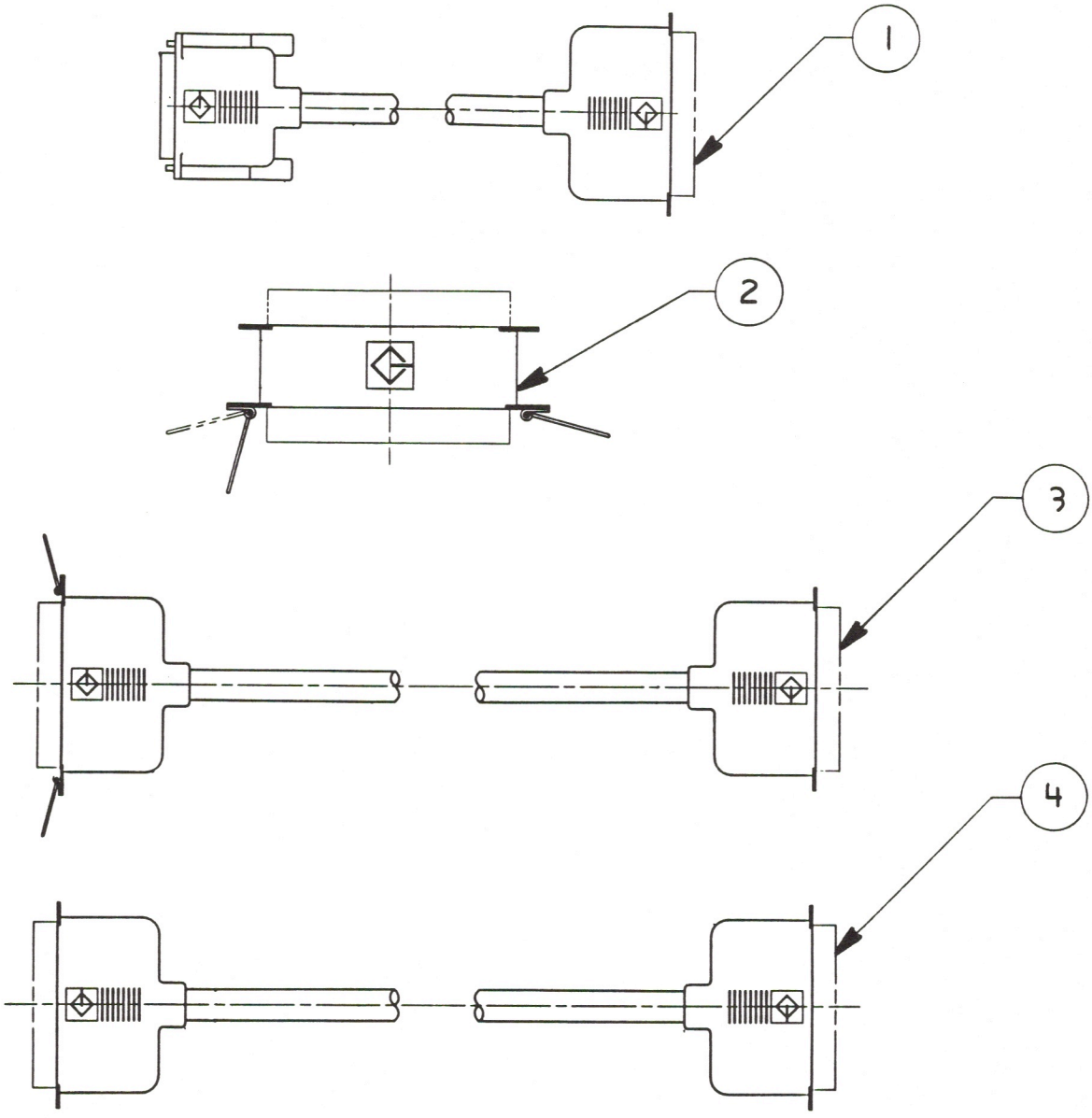


FIGURE 5

❑ SCSI HARD DISK DRIVES – CABLES (Figure 5)

Item	Part No.	Description
1	658-8031	System Cable
2	658-8032	Terminator Cable
3	658-8033	Extender Cable
4	658-8034	Peripheral I/F Cable

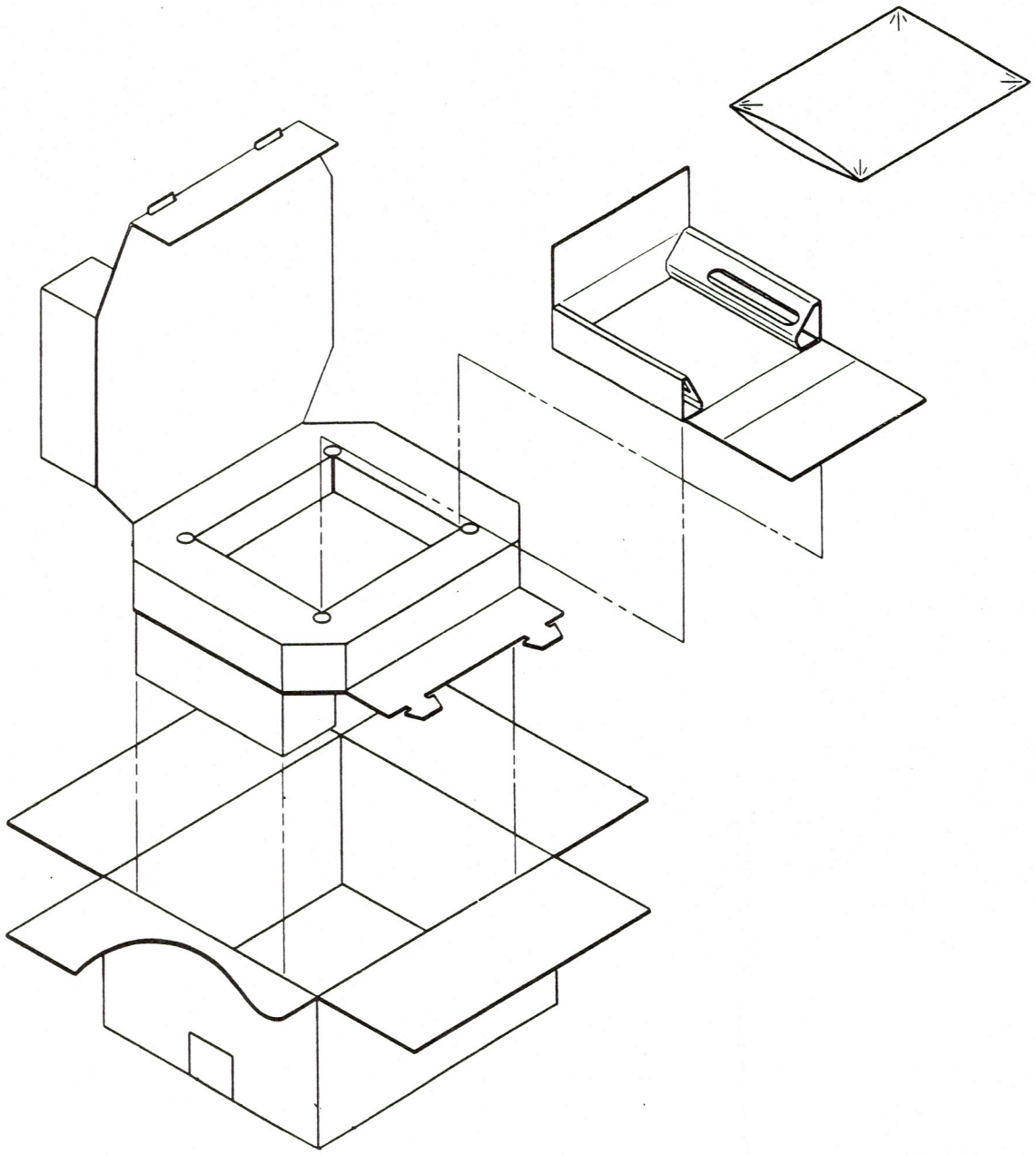


FIGURE 6

❑ SCSI HARD DISK DRIVES – SERVICE PACKAGING, 5.25 HDA (Figure 6)

Item	Part No.	Description
-	602-0148	Service Packaging, 5.25 HDA

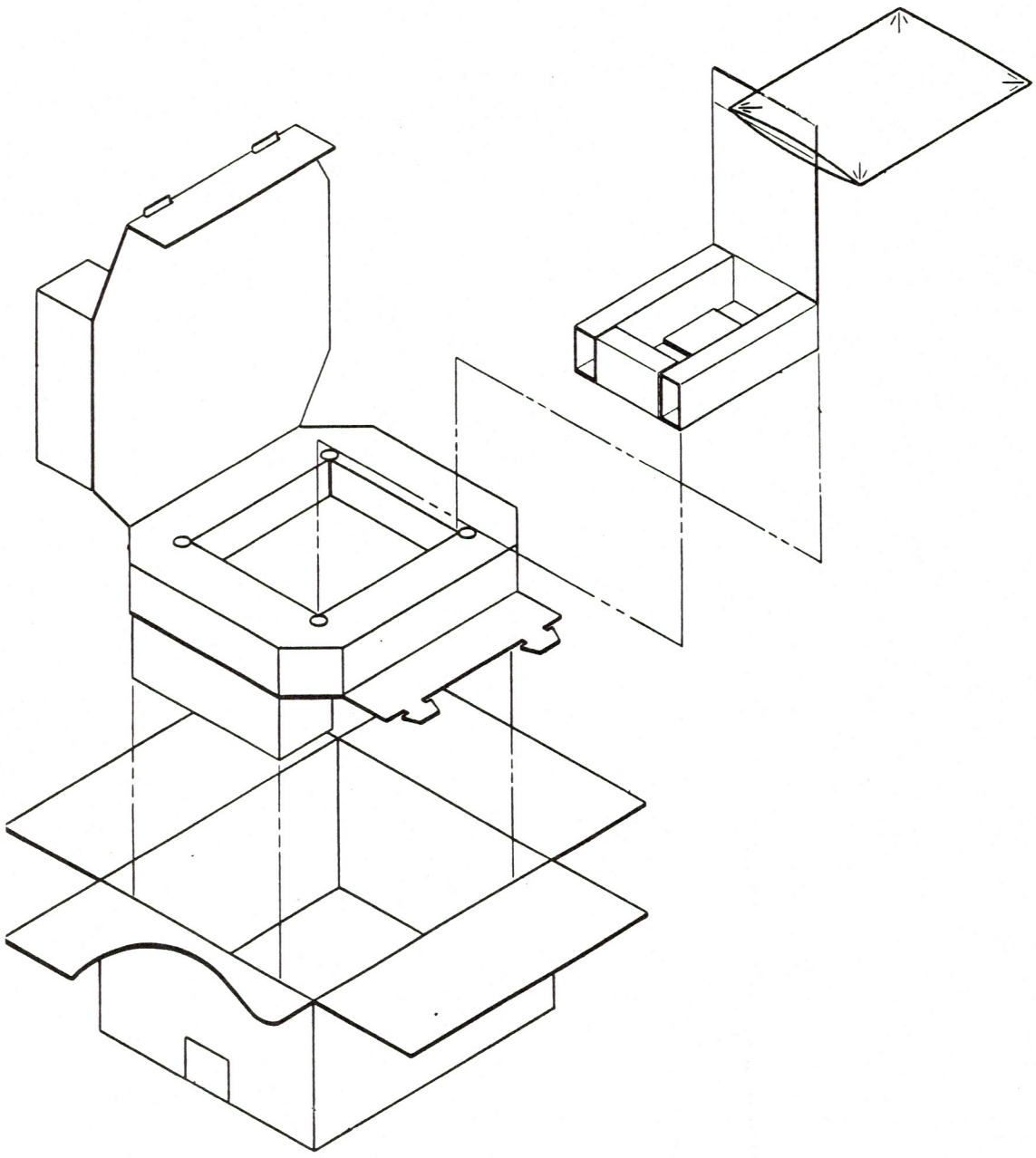


FIGURE 7

❑ SCSI HARD DISK DRIVES – SERVICE PACKAGING, 3.5 HDA (Figure 7)

Item	Part No.	Description
-	602-0164	Service Packaging, 3.5 HDA


Networks

Apple Talk

Apple Technical Procedures

AppleTalk

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Apple Technical Procedures

AppleTalk

Section 1 – Basics

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1.2 AppleTalk Hardware Overview
1.3 AppleTalk Network Cable
1.4 AppleTalk Connectors
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❑ APPLETALK HARDWARE OVERVIEW

The AppleTalk® Personal Network allows any Macintosh™, or Macintosh XL user to share the use of LaserWriter® Printers, file servers (disk drives for common access) and other servers.

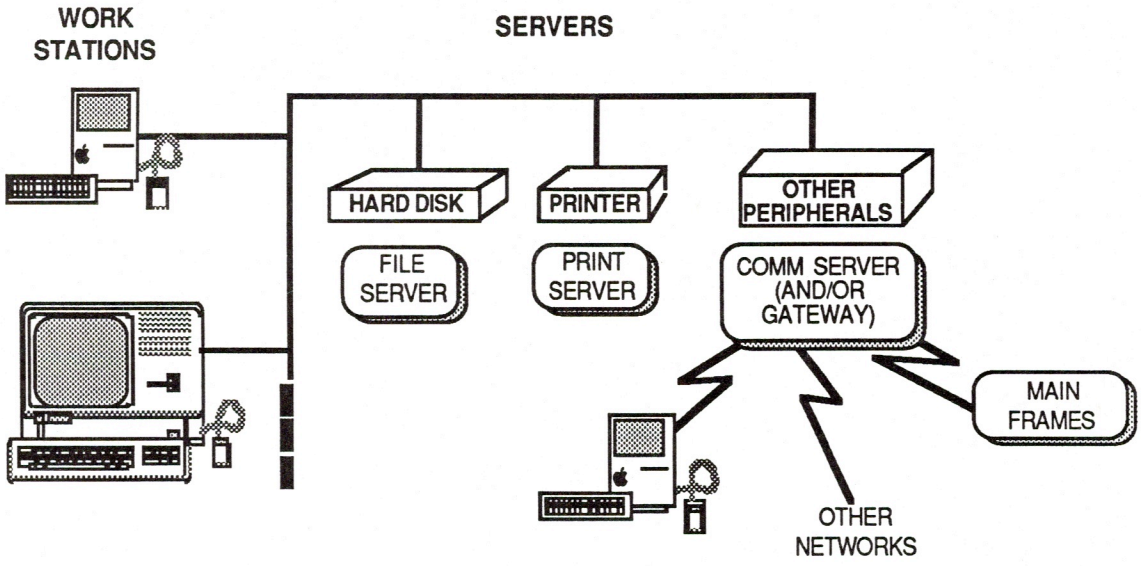


FIGURE 1

The AppleTalk Personal Network has three physical components: the network cable, the AppleTalk connector, and the cable extender (Figure 2).

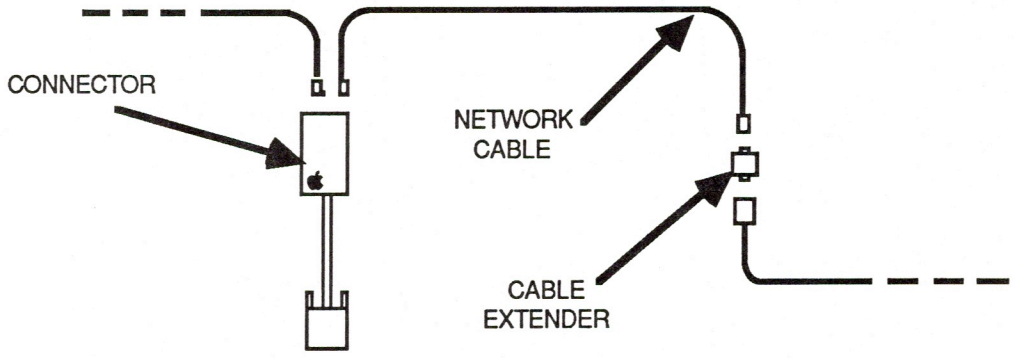


FIGURE 2

The AppleTalk connector is attached to a computer or other device; the individual AppleTalk connectors are then linked by means of the network cables. When all of the lengths of network cable are connected, they form a *network bus.*

Each device location on an AppleTalk network is called a *node.* When we refer to a node, we mean the device itself and the AppleTalk connector attached to it.

AppleTalk Network Cable

AppleTalk Network Cable is sold in two- and ten-meter lengths with preassembled connector plugs. It is also sold in kit form for custom installations. The kit contains a one hundred-meter spool of cable with unassembled connector plugs. The installer cuts the length of cable needed and then attaches a plug to each end.

The network cable is made up of two wires wrapped in a metal shield, which is then wrapped in electric insulation (Figure 3).

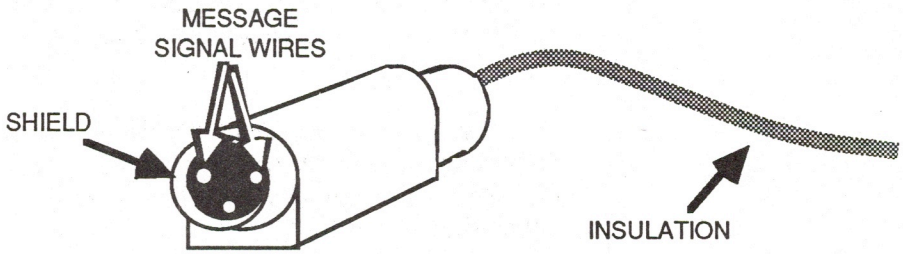


FIGURE 3

The two wires conduct the electric message signal to the AppleTalk connectors around the network.

The third pin on the network cable plug is not used.

AppleTalk Connectors

An AppleTalk connector is composed of a plug that fits into the back of the computer, a cable leading from the computer to the network, and a connection box (Figure 4).

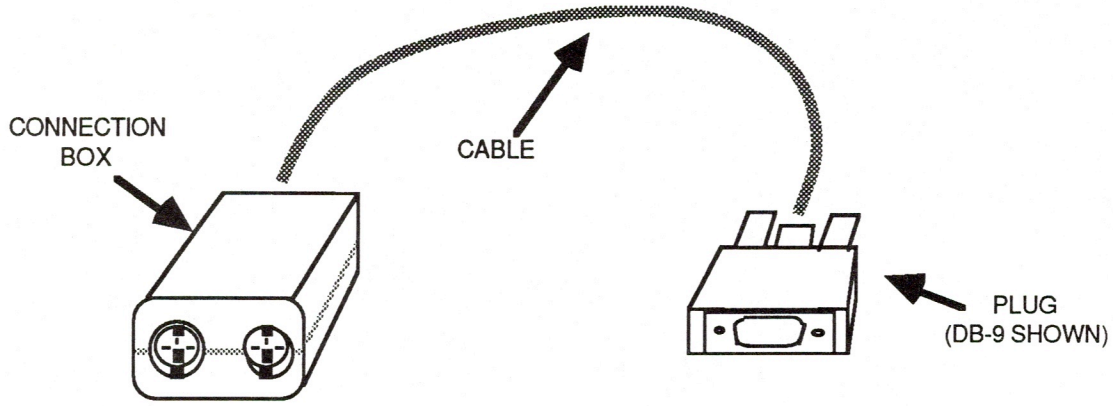


FIGURE 4

The plug for the Macintosh is a 9-pin DB type connector. For the Macintosh Plus, it is a Circular 8 connector. For the Macintosh XL, the plug is a standard DB-25 connector.

The connection box provides the node with a connection point onto the network. The connection box has electronic components inside and two sockets for network cable plugs.

The sockets on the connection box are interchangeable. It makes no difference which one a network cable is plugged into.

AppleTalk Cable Extender

An AppleTalk Cable Extender is a small double-ended connector that allows two pieces of network cable to be joined together to form a longer cable. A cable extender should not be used to terminate the cable.

❑ THEORY OF OPERATIONS

Note: In the following explanations, many of the terms and concepts have been simplified.

The AppleTalk Protocol

In the AppleTalk protocol, only one node may transmit (put message signals on the network cable) at a time. If two nodes were allowed to transmit at the same time, their signals would collide and be incoherent to the rest of the network, just as two people speaking at the same time prevent anyone from understanding them.

To make sure that only one node is transmitting on the bus at a time, all AppleTalk nodes follow a set of rules called *Carrier Sense, Multiple Access with Collision Avoidance* (CSMA/CA).

Carrier Sense

Carrier Sense means that before a node can transmit anything on the network, it will check the network cable to see if another node is transmitting. A node will not transmit if another node is transmitting on the network (see collision avoidance below).

Multiple Access

Multiple Access means that every node has equal access to the network cable through its connection box.

Collision Avoidance

Collision Avoidance refers to AppleTalk's method of minimizing collisions. If a node senses the bus and finds that the network is busy, it will wait until the network becomes idle (no node is transmitting on the network). When the network becomes idle, the node will continue to wait for an additional random period of time. If the network remains idle through this time, the node will begin its own transmission.

The AppleTalk Network Circuit

One of the most common reasons for a failure on AppleTalk is an improperly terminated bus. The AppleTalk bus is automatically terminated at any connector box to which only one cable is connected. The lack of a second cable causes the connector box to switch in a resistor to complete the bus circuit. Both ends of the bus must be properly terminated for proper operation. The following discussions explain why termination is necessary and why problems occur if the bus is terminated improperly.

The Network Cable Circuit

The network cable is made up of two message signal wires wrapped in a metal shield, which is then wrapped in electric insulation (Figure 5).

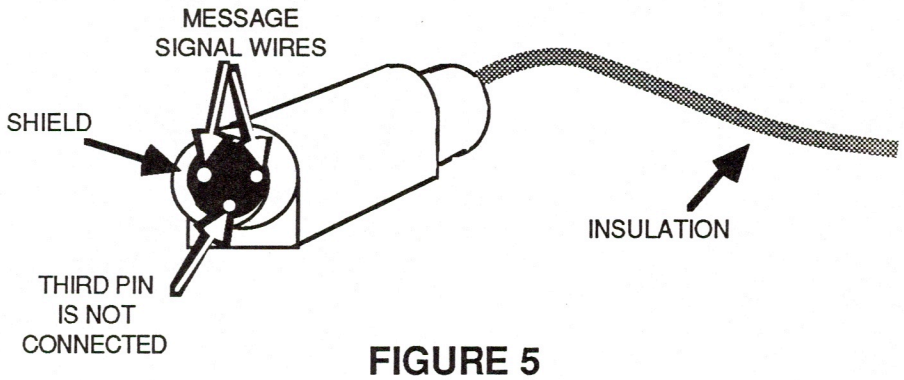


FIGURE 5

The two wires carry the message signals around the network.

The message signals have a maximum frequency of 230.4 KHz. That means that a transition from the most positive to the most negative voltage levels of the signal can happen up to 230.4 thousand times a second.

Each Node Is Transformer Coupled To Bus

There is an electronic component called a transformer in every connection box. Each node's transformer couples the node to the network bus. When a node transmits, it sends the message signal to the transformer, which conveys it onto the message wires of the network cable. The transformers in the other nodes' connection boxes allow them to read the message signal from the bus.

Differential Bus Signal

The message signal is put on the network cable in a differential fashion. That means that at any given time if the signal voltage on one of the message wires is positive, then the other wire will be negative, and vice versa.

Current Source and Return

Since electric current is often thought of as flowing from negative to positive, we will call the negative wire the source wire and the positive wire the return wire.

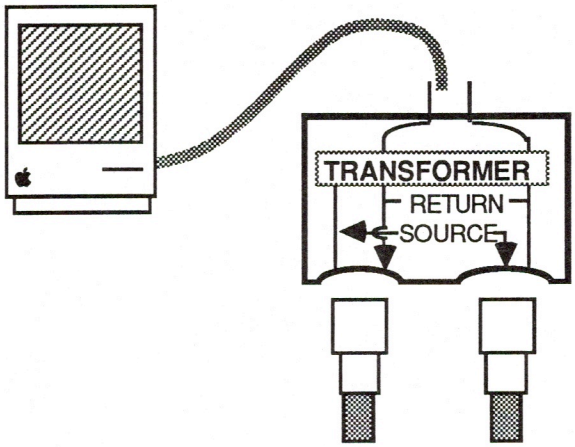
When the voltages change, the direction of current will change; thus the roles of the wires alternate. However, at any given instant during a transmission one wire will be the source and one the return.

> ***Note:*** The AppleTalk bus conforms to the electrical interface specifications defined in the Electronic Industries Association's *RS-449/422 Standard.* For more detailed information on the RS-449/422 interface, refer to that document.

Connector Boxes and Cables Form Bus Circuit

When a signal enters one socket of a connection box from a length of network cable, it will do one of two things, depending on whether or not a network cable is plugged into the other socket:

1. **Both sockets used:** All of the nodes except those on the two ends of the network bus will have cables plugged into both sockets. In this case the signal flows from one socket through to the other into the next length of cable (Figure 6).



NOTE:
THE DIRECTION OF CURRENT
CAN REVERSE AT UP TO
230.4 THOUSAND TIMES A SECOND

FIGURE 6

2. **One socket empty:** The end nodes will have a cable plugged into only one socket. Each connection box is designed so that if a socket is empty, a switch inside the box connects the signal wires from the other socket to a terminating resistor. The message signal current in the source wire flows through the terminating resistor back to the return wire, completing the circuit (Figure 7).

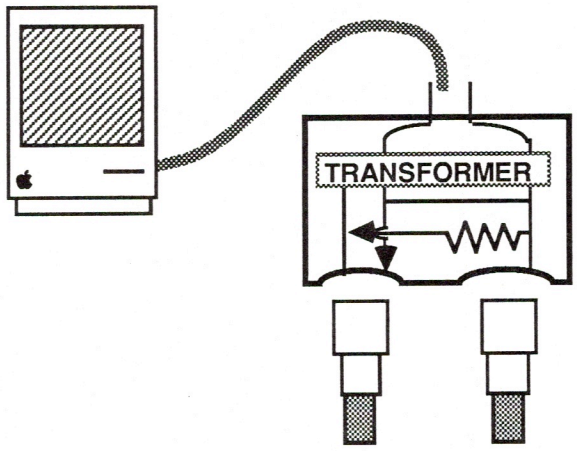
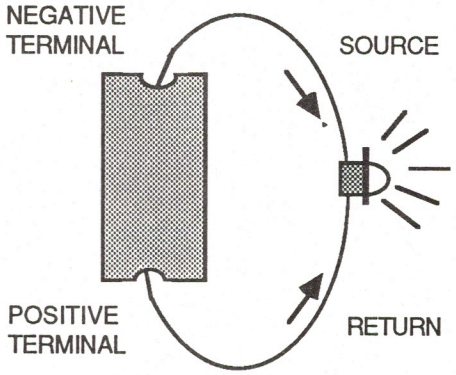


FIGURE 7

Current Flow In the Bus Circuit

In some ways, the AppleTalk Network Bus circuit is like the circuit in a flashlight (Figure 8).

FLASHLIGHT CIRCUIT WITH ONE BULB



FLASHLIGHT CIRCUIT WITH TWO BULBS

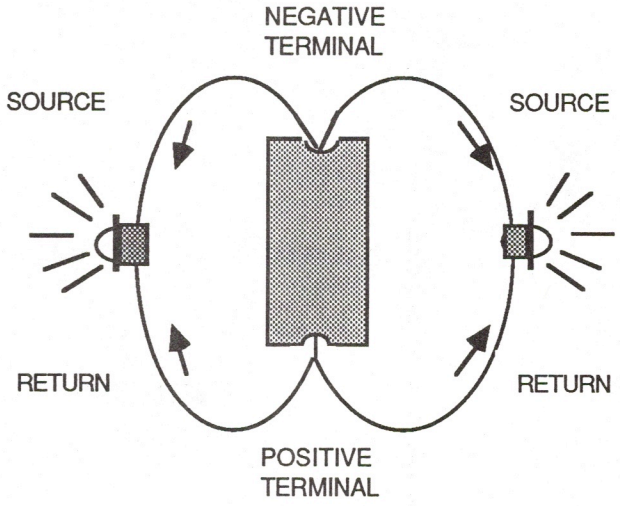


FIGURE 8

The current from the source (negative) wire flows through something called a load (a bulb for the flashlight and a terminating resistor for the AppleTalk bus) to the return (positive) wire. In the flashlight example above, two bulbs are shown to demonstrate that the current can be split at its source to travel through two loads and arrive at the same return point.

In the AppleTalk bus example in Figure 9, the same thing occurs. The only difference is that the current is going through two terminating resistors instead of two bulbs. In the flashlight, the battery provides the power, while in the AppleTalk bus the transmitting node provides the power in the form of the message signal.

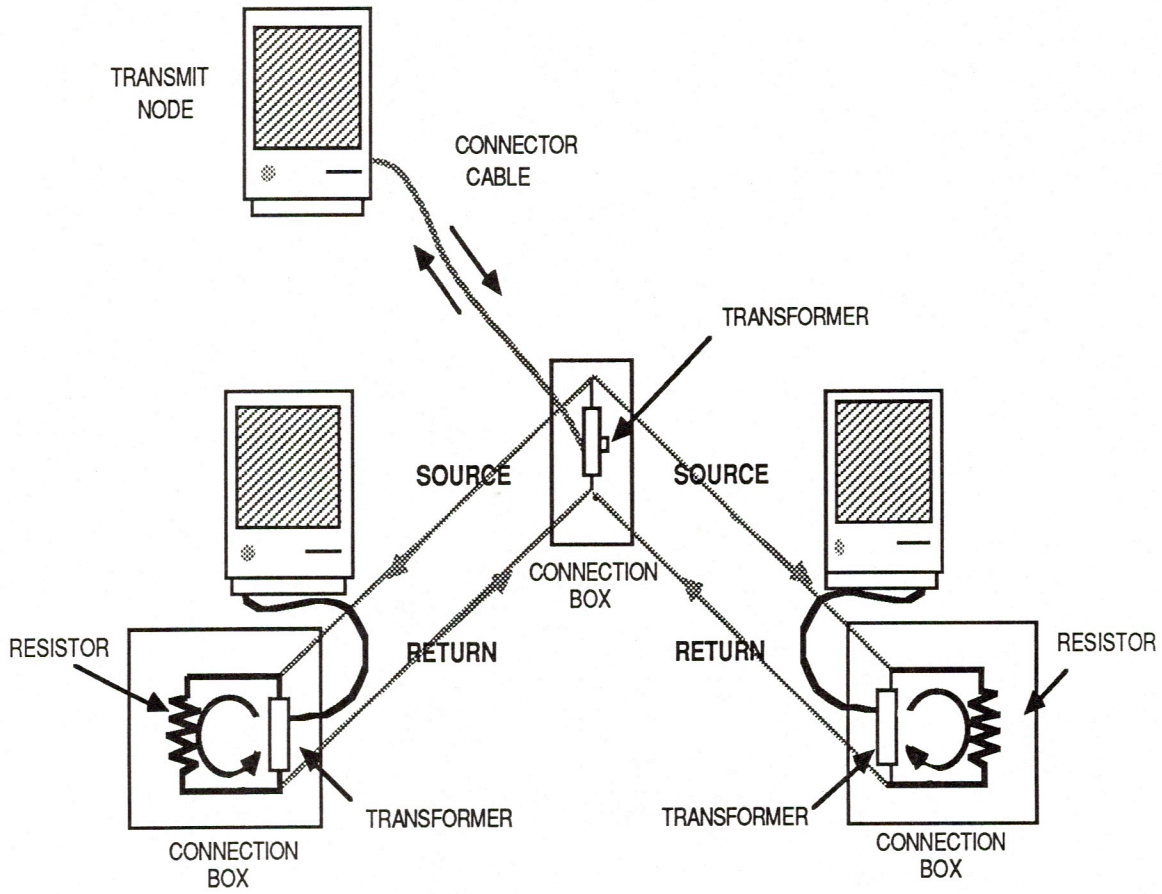


FIGURE 9

Bus Termination Problems

For the message signal current to flow smoothly and accurately, the impedance (explained below) throughout the network must be constant.

Impedance

Electric current is commonly compared to water flowing through a pipe. Impedance is like the resistance that the walls of a pipe present to flowing water. As long as the circumference of the pipe remains the same, the impedance to the flow of water is the same (Figure 10).

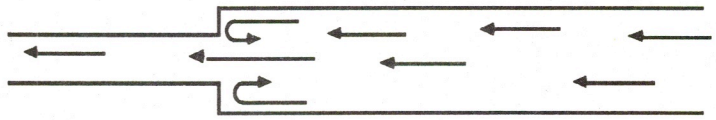


FIGURE 10

If at some point the pipe's circumference is reduced, the impedance to the flow will increase at that point and part of the water will be reflected back (Figure 11).

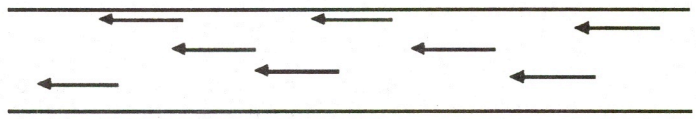


FIGURE 11

In an AppleTalk network the message signal current flows through the source message wire the way water flows through the pipe. It is important to avoid changes in impedance since that can cause reflections of the message signal similar to the reflections that occurred when the water encountered the narrower pipe.

If an AppleTalk network bus is terminated properly, the network cable on each end of the bus will be plugged into a connection box with an empty socket.

The connection box with an empty socket channels the message signal on the network cable's source wire through a terminating resistor to the return wire.

The terminating resistor provides the same amount of impedance as the network cable, so there will be no reflections of the message signal on the bus.

Dangling Cables

If a network cable is left dangling (Figure 12), when the current on the source wire reaches the unterminated end, it has no channel to take to the return wire.

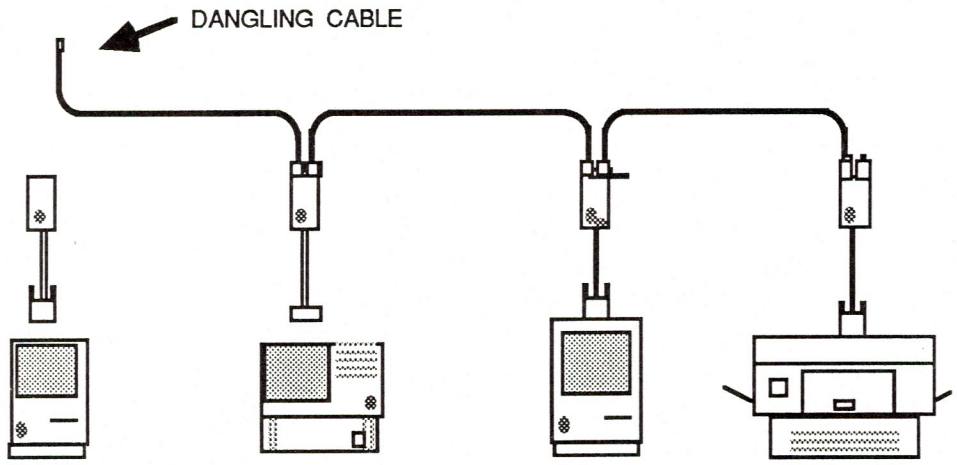


FIGURE 12

The message signal in a dangling cable has no place to flow once it reaches the end of the cable, so it is reflected back on to the source wire, like water run into a capped pipe (Figure 13).

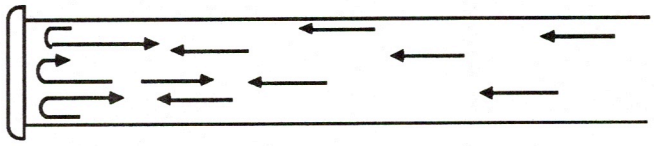


FIGURE 13

The reflections would bounce back along the source wire and mix with the original message signal (Figure 14). This would look like two nodes trying to talk at the same time, and that would interfere with communications.

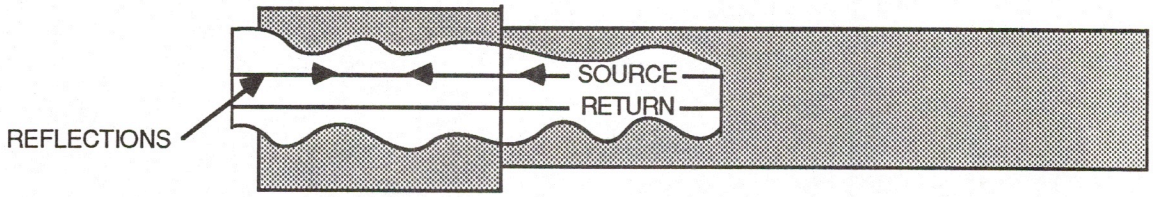


FIGURE 14

To prevent reflections of the message signal on the network, it is very important to **always terminate the ends of the network cable into a connection box.**

Circular Networks

When a signal is transmitted onto the network cable by a node somewhere in the center of a bus, the source signal is sent to both sides of the bus. If both ends are properly terminated (that is, each end plugged into a connection box), the message signal will flow through terminating resistors to the return wires to complete the circuit (Figure 15).

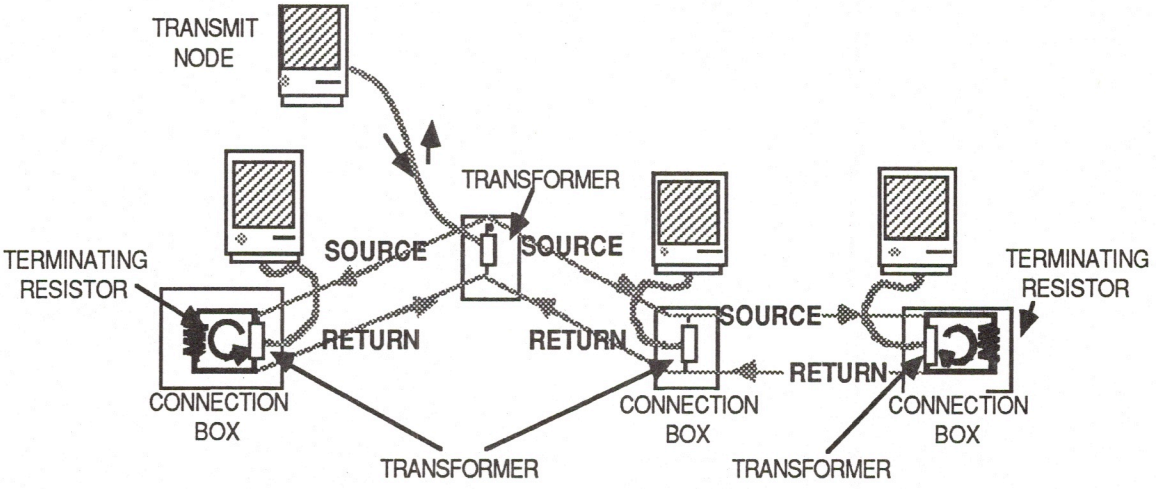


FIGURE 15

If the network cables are connected so as to form a closed loop, there is no way for the message signal on the source wire to flow to the return wire so the signals on both sides of the bus will collide with each other (Figure 16).

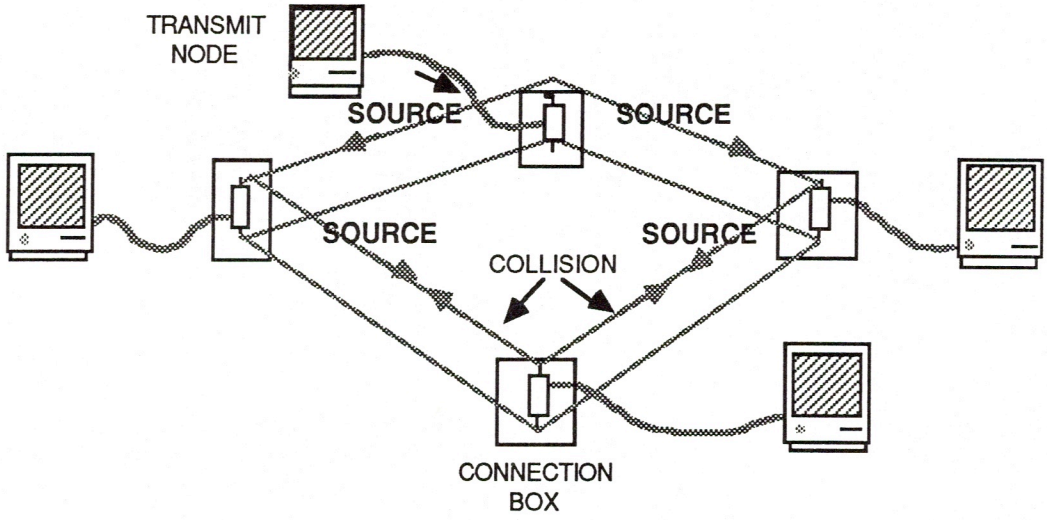


FIGURE 16

This would look like two nodes trying to talk at the same time, and that would interfere with communications. Therefore, it is also very important to **always terminate the ends of the network cable into connection boxes so that the network does not form a closed loop.**

Apple Technical Procedures

AppleTalk

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❑ INTRODUCTION TO NODECHECK

NodeCheck is a "roll call" test for the AppleTalk network. It can be used to test a network when it is first set up, to track down a problem when two or more devices (e.g., Macintoshes, LaserWriters) aren't communicating, or to check whether LaserWriter printers, file servers, gateways, etc., are connected.

The *NodeCheck* diskette can be used both on the Macintosh and on the Lisa/Macintosh XL running MacWorks™ (version 3.0 or later). If you are unfamiliar with the use of the Macintosh or MacWorks, refer to the appropriate owner's guides.

❑ STARTING UP NODECHECK

1. Insert the *NodeCheck* diskette and power up the system.

2. Select and open the *NodeCheck* disk icon.

3. Select and open the *NodeCheck* icon. After a few moments, the **AppleTalk Network Status** window will appear.

   Note: If you see the message: "AppleTalk isn't installed properly on system disk," check to see that the AppleTalk connector is connected properly.

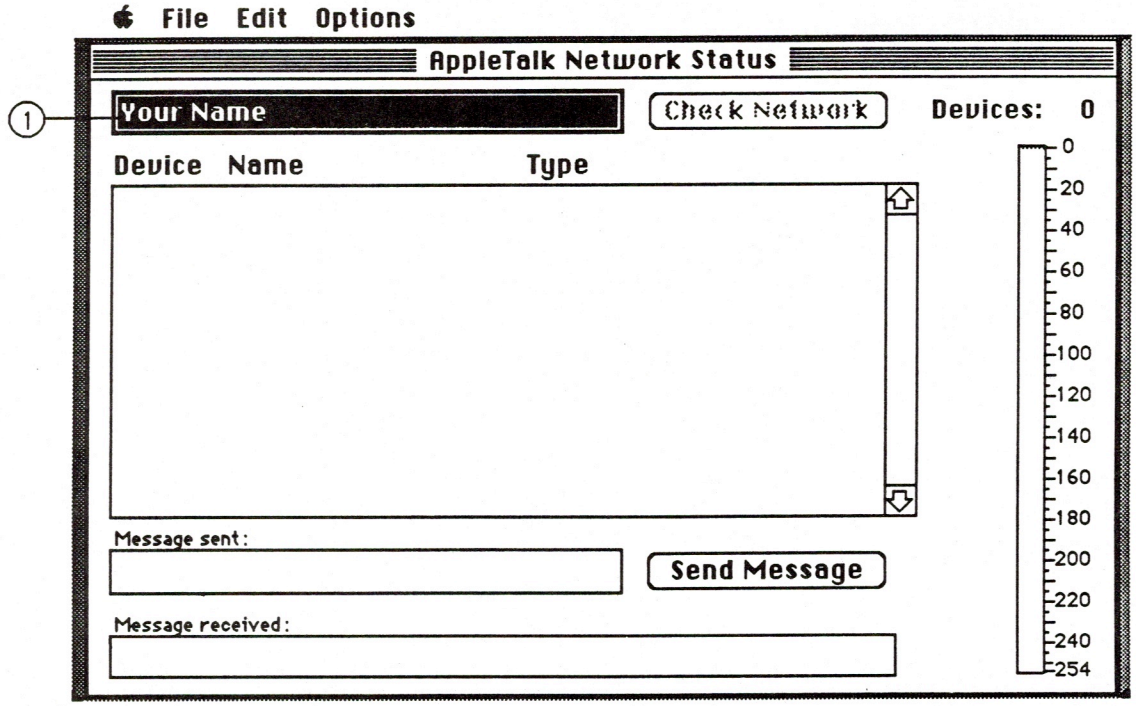


FIGURE 1

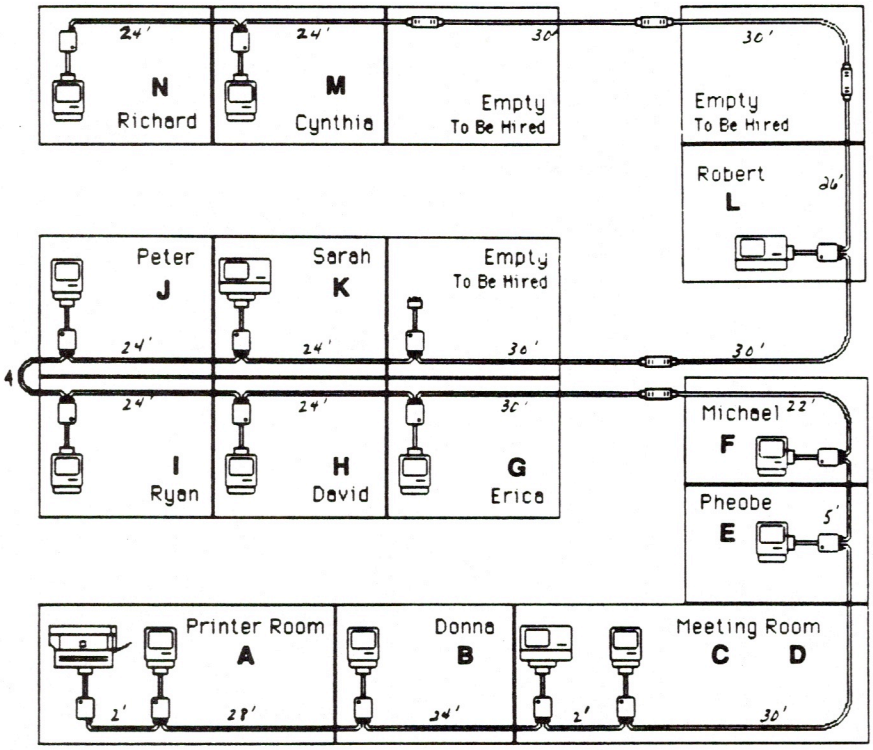


FIGURE 2

❑ USING THE APPLETALK NETWORK STATUS WINDOW

Naming Your Computer

Each time one of the network's computers or shared devices is turned on, a unique number (called a "device number") is assigned to it. The device number can be different every time the device is turned on. **The *NodeCheck* program can detect all of the devices on the network by their assigned device numbers, but it can only "talk" to the ones that are given a name.** LaserWriters and other shared devices have names (and types) "built in," but Macintoshes and other computers do not. To name the computers on your network, you must start up *NodeCheck* on each terminal and assign each a name.

The **Your Name** field in the **AppleTalk Network Status** window (Figure 1, #1) is activated as soon as you enter the program. Enter a name (up to 32 characters) for the computer you are working on. You can use the real person's name who uses that computer, or a letter code like A, B, C, etc. It is helpful to enter the name that appears on the network cabling diagram that was made at the time the system was set up (see Figure 2).

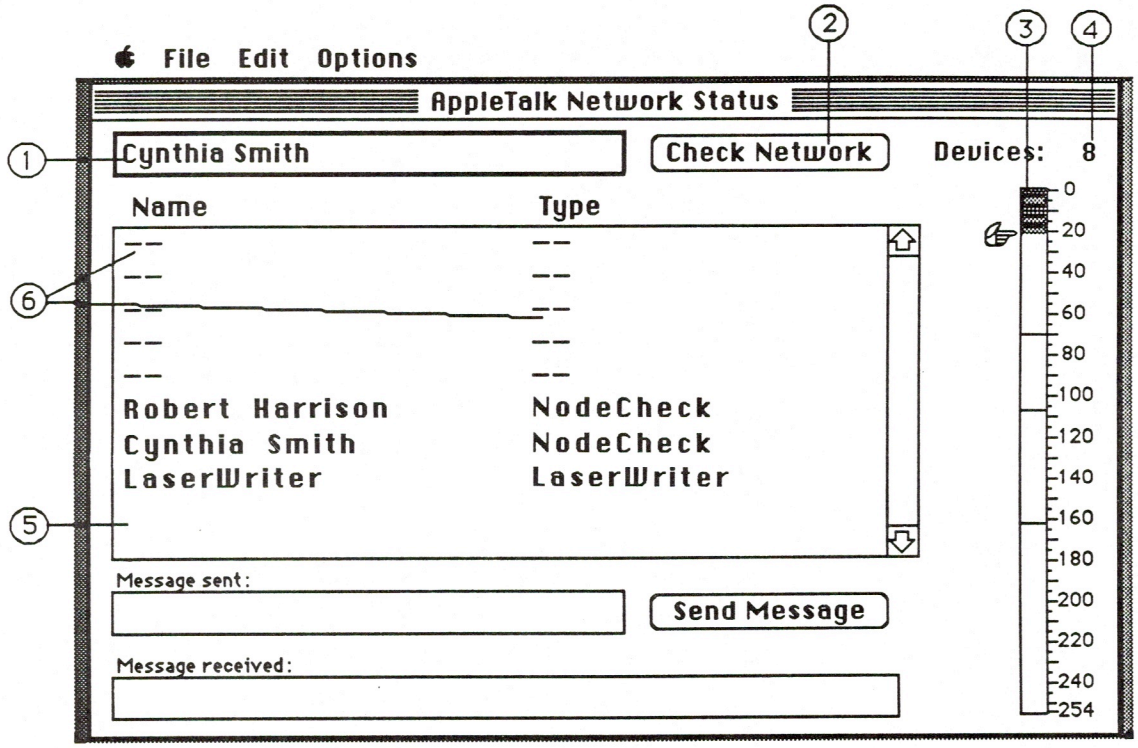


FIGURE 3

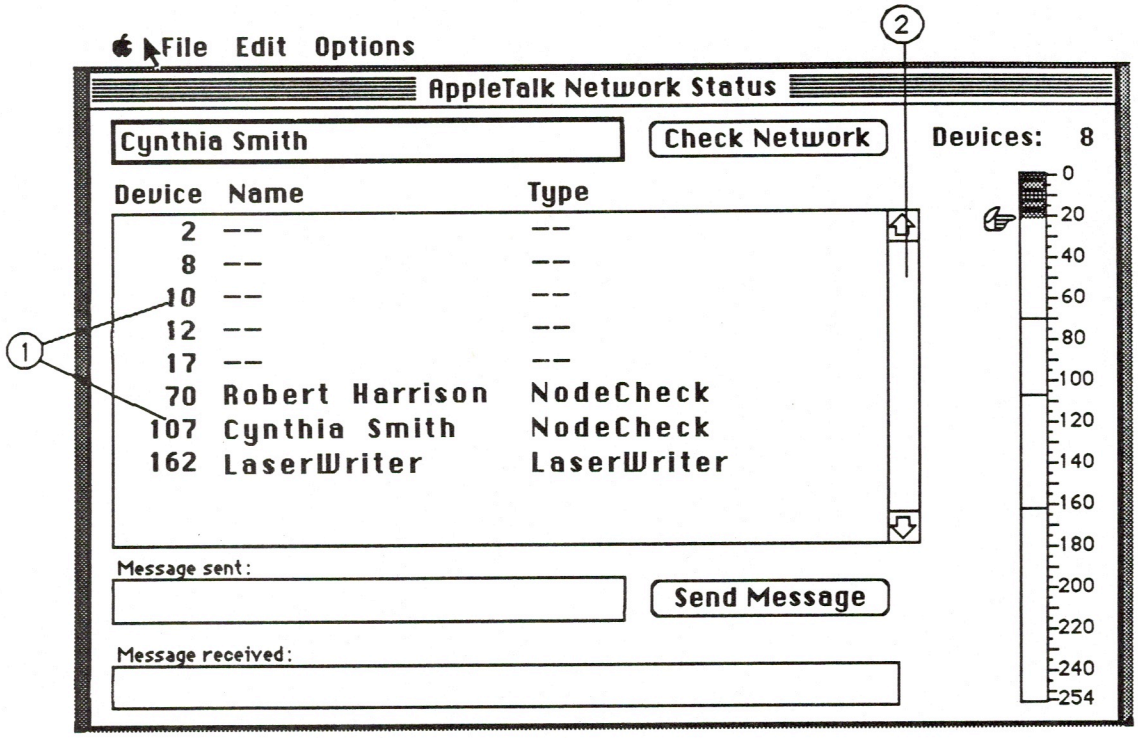


FIGURE 4

Checking the Network

After you have made an entry for **Your Name** (Figure 3, #1), press <Return> or click on **Check Network** (Figure 3, #2). *NodeCheck* registers the new name on the network and starts "looking" to see if there are any other devices on the network.

After the name you have entered is registered on the network, *NodeCheck* broadcasts to the network, in effect, "I am looking for devices. Please respond." When *NodeCheck* receives a response from a device, a line appears at its device number on the scale (Figure 3, #3). This process is actively demonstrated by the hand icon which moves down the left side of the scale, highlighting each device number as that device is "heard."

The scale, with the numbers 0 through 254, illustrates all the device numbers that can be assigned to the devices on the network. The numbers 0-127 are reserved for computers; 128-254 are reserved for LaserWriters and other shared devices.

Devices (Figure 3, #4) will show you how many named devices *NodeCheck* finds on the network, **or** the total of all devices. The **Options** menu allows you to choose whether *NodeCheck* displays **Named Devices Only** (the default) or **All Devices**. (For a listing of available menu items, see "NodeCheck Appendix", below.)

Named devices, as they respond, are listed in the *NodeCheck* window (Figure 3, #5) by Name and Type. If you have chosen **All Devices** from the **Options** menu, the unnamed devices will also be displayed, but represented only by dashes (Figure 3, #6).

You can list the devices by their device numbers as well as their names (Figure 4, #1), by choosing **Show Device Numbers** from the **Options** menu. (If all devices are being displayed, unnamed devices will be represented by numbers and dashes on the screen.) If there are more devices on the network than can fit on the screen, use the scroll arrows in the list box to display the remaining devices (Figure 4, #2).

AppleTalk Network Status

Device	Name	Type
2	Kathi Venz	NodeCheck
8	--	--
10	--	--
12	--	--
17	--	--
24	--	--
33	--	--
41	--	--
59	--	--
70	Robert Harrison	NodeCheck
82	--	--
90	--	--
94	--	--
95	--	--
107	Cynthia Smith	NodeCheck
115	--	--
162	Laserwriter	LaserWriter

FIGURE 5

AppleTalk Network Status

Device	Name	Type
107	Cynthia Smith	NodeCheck

FIGURE 6

Printing Device Information

You may print out any or all information in the *NodeCheck* window. To print device information for all devices, choose **Print All Devices** from the **File** menu. If the option **Show Device Numbers** was selected from the **Options** menu, the device information printed will also contain the device numbers, as well as names and types. Figure 5 shows a printout from an **AppleTalk Network Status** display listing all devices and their numbers.

To print information about a specific device or devices, first highlight the device(s) in the *NodeCheck* window list by clicking on the device name. (For multiple device selection, hold down the <Shift> key and click on each selection). Then choose **Print Selected Devices** from the **File** menu. Figure 6 shows the printout for a single selected device.

> ***Note:*** The *NodeCheck* diskette must be in the disk drive of the computer from which you give the print command. And in order to print, you must have previously set up and configured a printer for the network (see "NodeCheck Appendix").

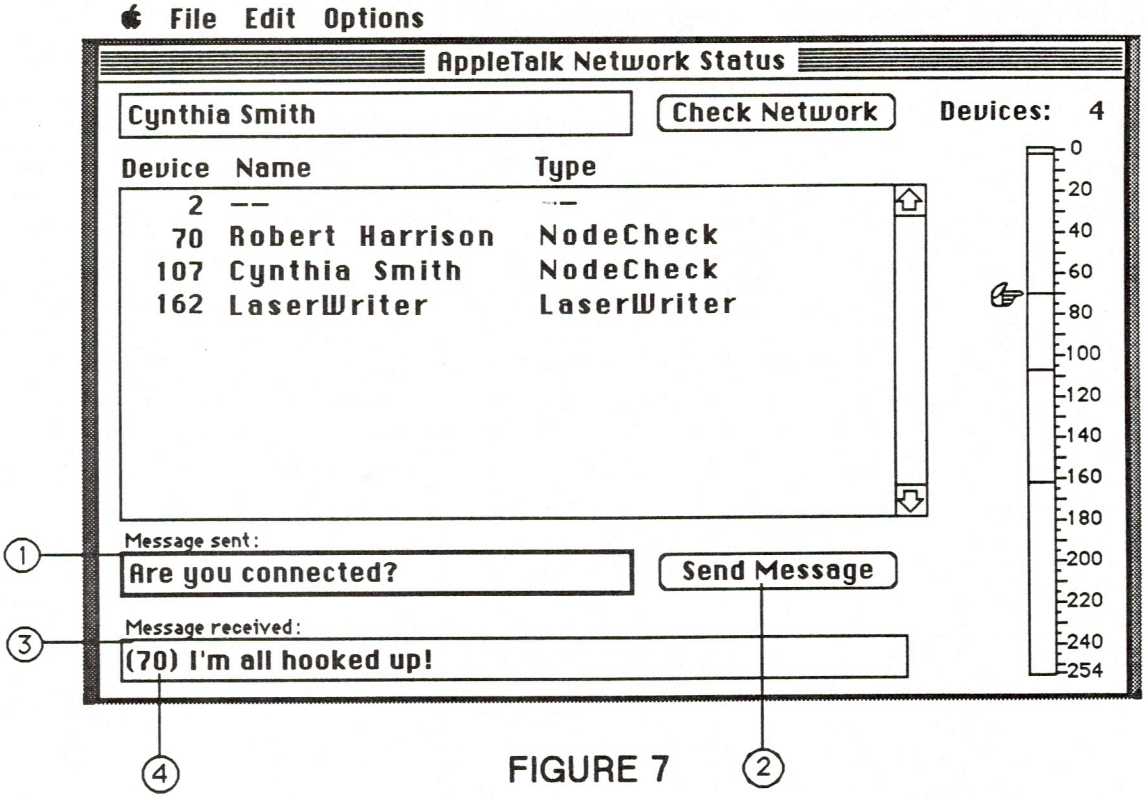


FIGURE 7

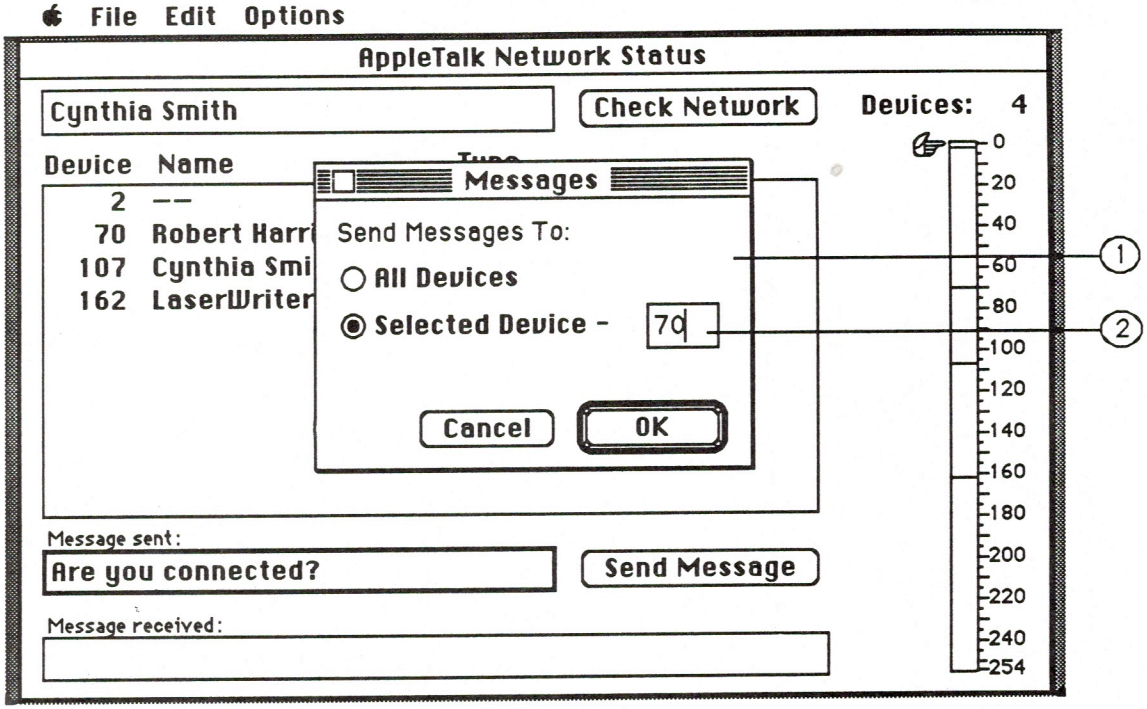


FIGURE 8

Sending Messages

You can use the **Message Sent** box (Figure 7, #1) to enter any message you wish to send to other devices on the network:

1. Highlight the **Message Sent** box by clicking on it or by pressing the <Tab> key. Then enter a message (up to 50 characters long) -- something like: "Are you connected?"

2. When you have finished typing your message, click on **Send Message** (Figure 7, #2). (If the **Message Sent** box is highlighted, pressing <Return> will also send the message.)

Your message will be broadcast to all devices on the network.

To send a message to a specific device, choose **Send Message To ...** from the **Options** menu and click on **Selected Devices**. Then, in the display which appears on the screen (Figure 8, #1), enter the desired device number in the box (Figure 8, #2) and click on **OK**.

You can also identify the selected device by clicking on its name in the *NodeCheck* window display list. Then choose **Send Message To...** from the **Options** menu, click on **Selected Devices**, and click on **OK**.

Receiving Messages

Messages are received in the **Message Received** box (Figure 7, #3). Each message is preceded by the device number of the sender (Figure 7, #4).

Messages from more than one device may be received, but only the last message received from each device will be shown. If more than one message is in the "queue," small scroll arrows will appear and allow the different messages to be scrolled into the **Message Received** box.

You can clear the **Message Received** box by choosing **Check Network** or turning off the computer.

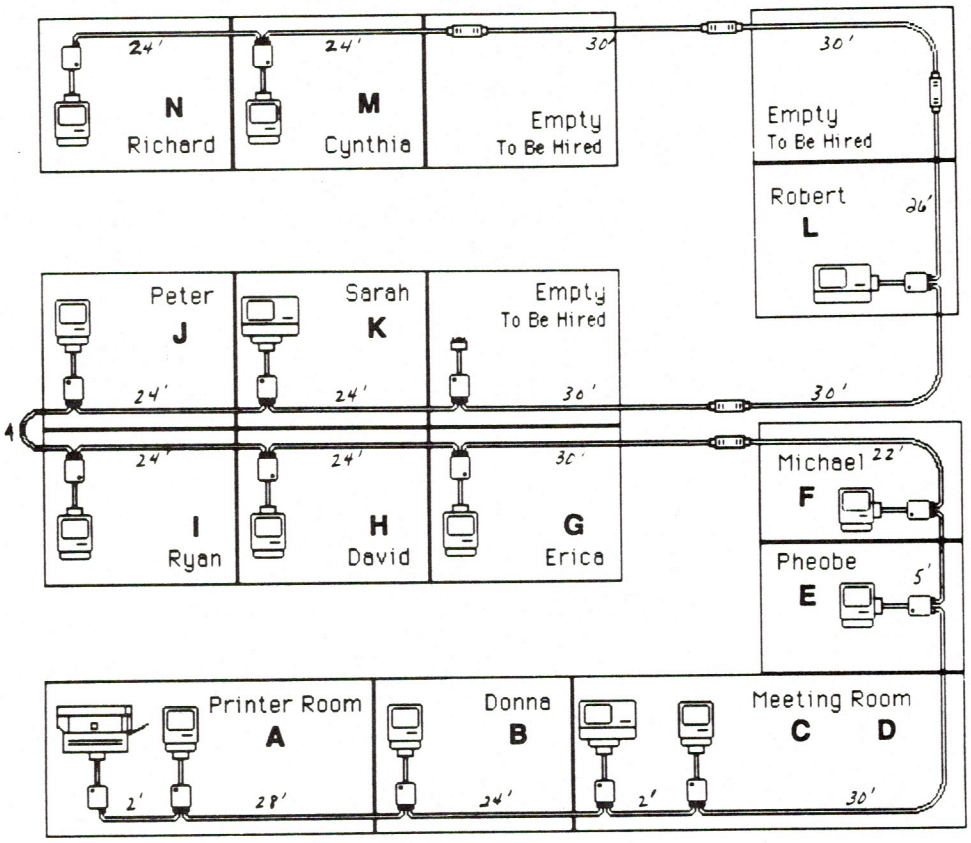

24'
24'
30'
30'
N
Richard
M
Cynthia
Empty
To Be Hired
Empty
To Be Hired
Robert
L
26'
Peter
J
Sarah
K
Empty
To Be Hired
24'
24'
30'
30'
24'
24'
30'
Michael 22'
F
I
Ryan
H
David
G
Erica
Pheobe
E
5'
Printer Room
A
Donna
B
Meeting Room
C
D
2'
28'
24'
2'
30'

FIGURE 9

❑ USING NODECHECK DURING NETWORK INSTALLATION

As you set up a network it is a good idea to use *NodeCheck* to ensure that all of the devices are correctly connected to the network. To do this:

1. Draw a cabling diagram and assign each computer a name (Figure 9).

2. Run *NodeCheck* on each computer as it is connected to the network: start up *NodeCheck* on the computer, enter the computer's assigned name, and click on **Check Network**. All computers and shared devices that are connected to this computer should be displayed on the screen.

   Note: You can start up *NodeCheck* on all the devices using the same *NodeCheck* diskette. Once the program is started up, simply select **Eject** from the **File** menu and take the diskette to the next device. The diskette is necessary only for starting up the program, for using desk accessories, and for printing.

3. When you have hooked up the last device and run *NodeCheck* on it, all of the assigned names should be listed on the **AppleTalk Network Status** display. If they are all listed, the network is functioning.

   Note: If you are setting up a network in several different rooms or floors of a building, the **Send Message** option can save you a lot of time and footwork.

   You can broadcast a message on the network, and an assistant can acknowledge your message by sending you a return message using the same method. All you have to do is wait for a response in the **Message Received** window.

   If you know the device number of your helper's computer, you can send the message to that specific device instead of to **All Devices**, and he can send his message to your specific device also.

❑ NODECHECK APPENDIX

Special NodeCheck Options

The **Apple**, **File**, and **Edit** menu options function as they do in other applications. The **Apple** menu contains help screens which tell about *NodeCheck's* uses. Unusual menu options are described below.

File Menu

The **File** menu has the following special options:

- **Print All Devices** prints a copy of the full *NodeCheck* device list.
- **Print Selected Devices** allows you to print device information about devices you have selected from the *NodeCheck* window list.
- **Quit** allows you to exit the program. If you have changed program options, you are asked if you want to save the program options before quitting. The term "program options" refers to those options, if any, that you have chosen from the **Options** menu. If you choose **Yes**, the options you have selected during this session will be in effect the next time you start up *NodeCheck*. If you select **No**, the options will revert to those that were in effect before this session. If you select **Cancel**, you will be returned to the program without quitting.
- **Eject** allows you to eject the diskette from the drive.

Options Menu

The **Options** menu has the following special items:

- **Show Device Numbers/Don't Show Device Numbers** allows you the option of displaying the devices' address numbers.
- **Named Devices Only/All Devices** allows you to display only those devices that have names (devices running *NodeCheck* or shared devices), or to display all of the devices on the network.

...Continued on next page

- **Send Message To...** gives you the choice of sending a message to one selected device or to all of the devices on the network. This is useful for setting up and troubleshooting a network.

- **Sound**, when checked, makes *NodeCheck* audibly "beep" whenever a message is received and whenever a device changes its name or logs on or off the system.

Putting NodeCheck on a Hard Disk

You can install *NodeCheck* on the hard disks of network computers, so that you can check the network at any time without using a *NodeCheck* diskette.

1. First, make sure the AppleTalk device driver is installed on the Macintosh XL hard disk (under *MacWorks*). (Use the *AppleTalk Install Program.*)

2. Insert the *NodeCheck* diskette into the drive.

3. Select and open the *NodeCheck* diskette icon.

4. Select the *NodeCheck* icon and drag it on top of the hard disk icon.

The program will be copied from the diskette to the hard disk.

AppleTalk and Printer Configuration

If you wish to print out *NodeCheck's* device information, you must configure the computer(s) to print with an attached or shared printer. This must be done from the desktop. With 128K systems, the printer configuration must be set up before you open the *NodeCheck* icon, and you must not open the **Chooser** option after beginning the *NodeCheck* program. With 512K and larger systems, the **Chooser** icon may be accessed at any time during the running of *NodeCheck.*

1. Make sure the NodeCheck diskette is in the computer's internal disk drive.

2. Select **Chooser** from the **Apple** menu.

...Continued on next page

3. Choose the appropriate printer and the proper (modem or printer) port.

4. Click on **OK**.

Note: If the desk accessory **Chooser** is not available from the **Apple** menu, copy the *NodeCheck* icon to a diskette containing the **Chooser** accessory.

AppleTalk

Section 3 – Troubleshooting

❑ CONTENTS

3.3 Before You Begin Troubleshooting
3.3 Familiarize Yourself With AppleTalk
3.3 You Will Need a Node Location Diagram
3.5 Draw a Node Location Diagram
3.6 Troubleshooting Procedure
3.6 Before You Go On-Site
3.7 At the Customer's Site
3.10 Symptom/Cure Tables
3.10 One Node
3.12 Some Nodes
3.14 All Nodes

❑ BEFORE YOU BEGIN TROUBLESHOOTING

Familiarize Yourself With AppleTalk

Refer to "Theory of Operations" in Section 1, Basics, to make sure that you can identify the AppleTalk Personal Network components and understand their function.

You need to know that:

- A **node** is an AppleTalk connector and the device attached to it (Macintosh, Macintosh XL, LaserWriter, etc.).
- A **node location diagram** is a drawing of an AppleTalk network installation showing the location of all the devices on the network.

You Will Need a Node Location Diagram

In order to isolate a problem to a particular node or connection, you need to know where each node is located in relation to the rest of the nodes in the network.

- **If you don't have an accurate diagram,** refer to the "Draw a Node Location Diagram" procedure in this section.
- **If you have an accurate diagram,** go to the "Before You Go On Site" procedure in this section.

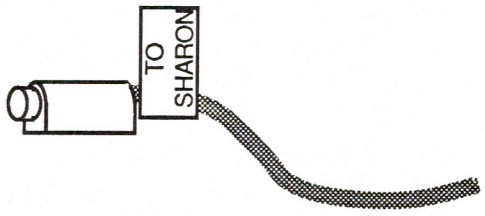


FIGURE 1

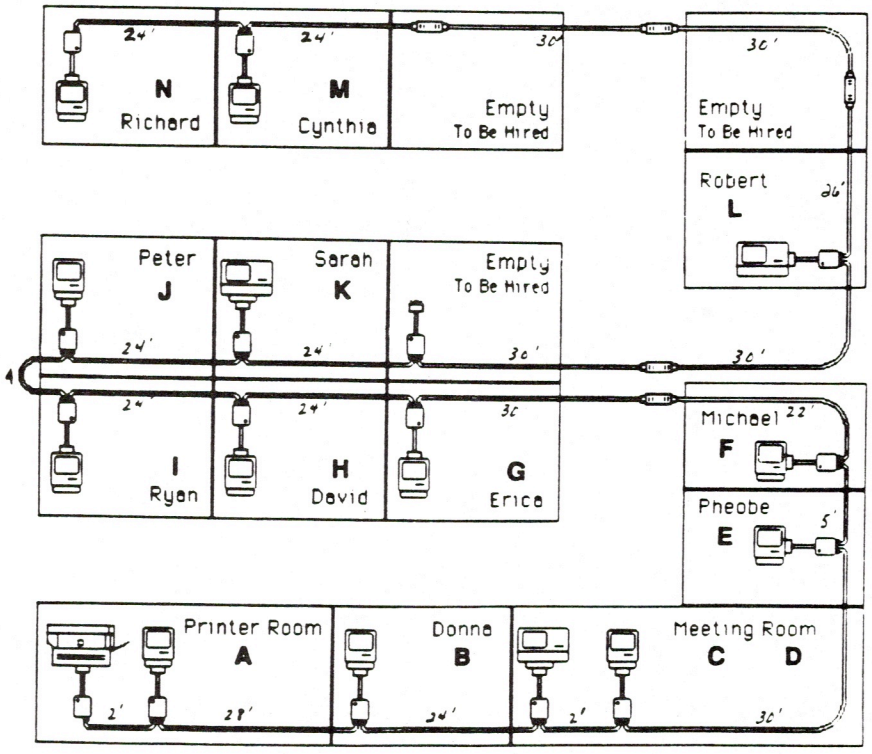


FIGURE 2

❑ DRAW A NODE LOCATION DIAGRAM

In order to isolate a problem to a particular node or connection, you must know where each node is located in relation to the rest of the nodes in the network.

Materials Required

Pencil and paper
Straightedge (ruler)
Masking Tape

Procedure

1. Label each connector box in the network with a piece of masking tape.

    - If the device is a computer, write the name of the person who will be most often using it on the tape label (see Figure 1).

    - If the device is a server, write the AppleTalk name given to the device on the connector box tape label.

2. Wrap a piece of tape around the plugs of both ends of every section of cable in the network to make a tag (see Figure 2). Write the name given to the device connected to the other end of the cable (e.g., "goes to Sharon", or "goes to LaserWriter1", etc.) on to the tag.

3. Draw a rough diagram of the network (include approximate cable length dimensions if possible).

4. Make copies of the diagram.

    - Give one copy of the diagram to the customer and advise him to correct the diagram whenever the layout of the network changes. Advise him to keep the diagram in a safe place.

    - Keep one copy for yourself in a safe place for future reference.

❑ TROUBLESHOOTING PROCEDURE

Materials Required

1 *NetCheck* program
3 Macintosh AppleTalk connector boxes
1 Macintosh XL AppleTalk connector box
2 Two-meter AppleTalk cables
2 Ten-meter AppleTalk cables

Before You Go On-Site

1. Contact the customer at the problem site by phone and try to guide the customer to solve the problem. Suggestions:

   a) If a server is involved in the problem, have the customer check and confirm its configuration.

   b) Have the customer check and confirm the network configuration:

   - There should be fewer than 32 nodes on the network.
   - The network should be less than 1000 feet long.
   - There should be two nodes at each end of the network that have only one cable inserted into their connector boxes (e.g., no dangling cables or circular networks).

2. If the problem can't be found by the customer:

   a) Ask the customer for a list of all node devices on net.

   b) Collect the items below before going to the customer's site:

   - Any documentation (troubleshooting procedures, takeapart, etc.) that may help you on site.
   - Diagnostics for node devices on network
   - Spares kit for any suspect devices
   - The items listed in "Materials Required" (above).

At the Customer's Site

1. Go to the customer's site with the materials that you collected in the "Before You Go On Site" procedure.

2. Verify that there is a problem by replicating the situation as described by the user. Check for:

   - Configuration problems
   - User error
   - Software (compatable system files, etc.)

3. Allow the customer as much use of the network as possible while you troubleshoot. Below are two troubleshooting procedures. If no one is using the network, follow the "Take Down the Whole Network" procedure. However, if customers are using the network, follow the "Split-Half Search With Users On Line" procedure. Refer to the "Common Problems" table following these procedures for help in solving the problem.

Take Down the Whole Network

If no customers are using the network, start up *NetCheck* on each computer and assign each node the name that appears on the cabling diagram. Once all the computers are running *NetCheck*, all names should be listed at each computer.

- If a node does not have a complete listing, locate the names missing from the computer's screen on the node location diagram, and go to the "Problem/Cure Table" in this section for help in solving the problem.

- If all nodes are listed at each computer, then the AppleTalk hardware must be functioning correctly.

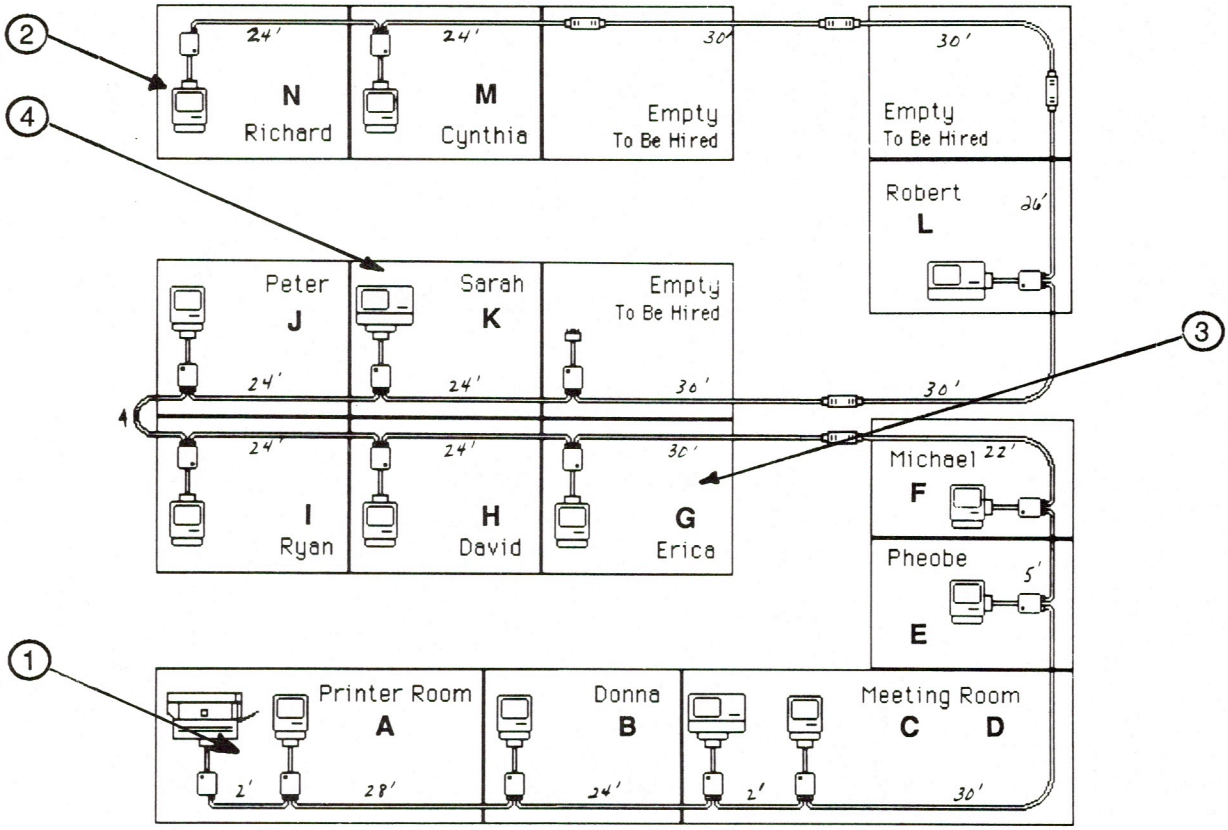

2
4
3
1
24'
24'
30'
30'
N
Richard
M
Cynthia
Empty
To Be Hired
Empty
To Be Hired
Robert
L
26'
Peter
J
Sarah
K
Empty
To Be Hired
24'
24'
30'
30'
24'
24'
30'
I
Ryan
H
David
G
Erica
Michael
F
22'
Pheobe
E
5'
Printer Room
A
Donna
B
Meeting Room
C
D
2'
28'
24'
2'
30'

FIGURE 3

Split-Half Search With Users On Line

If any customers will be using the network while you troubleshoot, you can allow work to continue by using the "split-half search" technique below:

1. Start up *NetCheck* at each end of the system. For example, in the office diagrammed at left, we could start up *NetCheck* on the computers named A and N (Figure 3, #1 & #2)—the two ends of the network.

2. Are both A and N listed in the *NetCheck* window?

   - If they are, the network cable (the "bus") is OK. The problem may be that one or more shared devices are not working, that AppleTalk is not configured or connected to the printer port, or that the LaserWriter or another shared device is not configured correctly.

     Note: AppleTalk only works when connected to the printer port (Port B on a Macintosh XL).

   - If A and N are not both listed, start up *NetCheck* on a computer in the middle of the network. In our example, you would start up *NetCheck* on computer G (Figure 3, #3).

3. If computer G lists one end (computer A or N) as there, that half (the network bus in that direction) is OK. You know the problem must be in the other half of the network. For example, if computer G's display lists A but not N, you know the problem must be located in the half of the network between G and N.

4. Now split the bad half of the network in half again, and check to see which side is listed (and therefore OK). For example, run a **Check Network** from computer K (Figure 3, #4). If N is listed on the display, you know that the section of the network between K and N is OK, and the problem must be located somewhere between G and K.

5. Keep eliminating the good half and splitting the bad half until you have isolated the problem.

❑ SYMPTOM/CURE TABLES

There are three "Symptom/Cure" tables below and on the following pages: "One Node", "Some Nodes", and "All Nodes". Refer to the table that most closely corresponds to the problem on your AppleTalk network. If you need more information about the problem follow the AppleTalk Troubleshooting procedure found earlier in this section.

One Node

- *One Node is not Listed*

During *NetCheck*, a single computer's assigned name is missing from the listing on the other computers.

Try each of the following until the problem is solved:

1. Replace the suspect computer's connector box.
2. Swap the suspect computer with a known good computer of the same type (e.g., Macintosh 512, Plus, XL, etc.).
3. Shorten the network cable by at least 10 meters.

- *Macintosh XL Error Message*

A Macintosh XL shows an error message: "Having trouble obtaining device names"

– Use version 3.0 of MacWorks or one that is even more recent.

- *Application Error Message "Unable to Send Message"*

Try using *Chooser* to list the destination device from nodes at various locations around it on the network.

1. Try using *Chooser* to list the server from nodes at various locations around it on the network. If the device isn't visible to any node with *Chooser*, try reinitializing the device. If no other nodes can see the device, go to the Some Nodes symptom table.
2. If the device is invisible to only one node, replace the suspect computer's connector box.
3. Verify that the system file's device drivers are OK.
4. Shorten the network by at least 10 meters.

- *Node Sees Others But Isn't Seen Itself*

When you run "Check Network" during *NetCheck*, your computer lists the other devices, but the other devices do not list your computer on their screens. ("You can see them but they can't see you.")

Try each of the following until the problem is solved:

1. Your computer may have been started up before the AppleTalk cable was attached to it. Turn off the computer. Then insert the *NetCheck* diskette and power up the system.
2. Check all connections for a tight fit and make sure the network's ends are terminated correctly. (Hint: Be careful not to create a "circular network" -- that is, a network that is connected in a circle.)

- *Server Not Listed During NetCheck*

During *NetCheck*, a server's name is missing from the listing on "all" computers.

Try each of the following until the problem is solved:

1. Try using *Chooser* to list the server from nodes at various locations around it on the network. If the device isn't visible to any node with *Chooser*, try reinitializing the device.
2. Replace the suspect server's connector box.
3. If some nodes list the device with *Chooser* and some don't, use the Split-Half troubleshooting procedure with *NetCheck* (explained in this section) to isolate the problem.
4. Disconnect the server from the rest of the network but leave one computer connected to the server with the same cabling normally used by the network. Run *NetCheck* in the single computer. If the server's name still does not appear, perform each of the following steps, rechecking for the problem after each one:
   a) Turn the server off for a few seconds and turn it back on to reinitialize it.
   b) Troubleshoot the server to ensure that it is operating correctly.
   c) Replace the section of cable between the computer and the server.
   d) Shorten the network cable by at least 10 meters.

Some Nodes

- *Network Divided Into Groups*

It appears from the *NetCheck* results that there are two separate groups of computers on the network. Members from each group may or may not sporadically see members of the other group

Try each of the following until the problem is solved:

1. Check connections.
2. Replace the section of cable that separates the two groups.
3. Replace the AppleTalk connector boxes at both ends of the network.
4. Shorten the network cable by at least 10 meters.

- *Application Displays Error Message*

A node not running *NetCheck* displays the error message: "AppleTalk not installed correctly on system disk."

AppleTalk must be installed on the boot disk (except *NetCheck*). If it is not, copy the system folder from the *NetCheck* diskette onto the other boot disk (or use the AppleTalk installer program); then reboot. Also, on a Macintosh XL, AppleTalk must be connected to Port B.

- *NetCheck Does Not List Some Computers*

While running **Check Network** during *NetCheck*, your computer lists some computers but not others. Other computers may not list your computer.

This indicates a faulty AppleTalk connection or connector on your computer. Try each of the following until the problem is solved:

1. Check connections.
2. Replace the suspect node's AppleTalk connector.
3. Replace the AppleTalk connectors at both ends of the network.
4. Shorten the network cable by at least 10 meters.

- *NetCheck Displays Error Message*

During *NetCheck*, this error message appears: "Having technical difficulties with AppleTalk." When you run **Check Network**, your computer lists the other devices, but the other devices do not list your computer on their screens. (You can see them but they can't see you.)

1. Check connections.
2. Replace the suspect node's AppleTalk connector.
3. Replace the AppleTalk connectors at both ends of the network.
4. Shorten the network cable by at least 10 meters.

- *Application Error Message "Unable to Send Message"*

Try using *Chooser* to list the destination device from nodes at various locations around it on the network.

- If the device isn't visible to any node with *Chooser*, try reinitializing the device.

- If some nodes list the device with *Chooser* and some don't, use the Split-Half troubleshooting procedure with *NetCheck* (explained in this section) to isolate the problem.

- Verify that the system file's device drivers are OK.

...Continued on next page

All Nodes

- *NetCheck Lists No Devices*

No devices are listed at any computer during *NetCheck*.

Try each of the following until the problem is solved:

1. Use the Split-Half troubleshooting procedure with *NetCheck* (explained in this section) to isolate the problem.
2. Check connections.
3. Turn all servers off for a few seconds then turn them back on to reinitialize them.
4. Replace the AppleTalk connectors at both ends of the network.
5. Shorten the network cable by 10-meter sections until the problem is solved. Examine the area around the last removed section of cable for RFI generators (electric motors, arc welders, etc.).


AppleShare

Apple Technical Procedures

AppleShare

Section 1 – Troubleshooting

❑ CONTENTS

1.2 Introduction
1.2 Documentation Available
1.3 Troubleshooting Tips
1.3 Installation
1.3 Application Compatibility
1.4 System Software Compatibility
1.4 Desk Accessories
1.4 Miscellaneous Tips

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❑ INTRODUCTION

This section of the *Technical Procedures* contains troubleshooting hints and tips; it is not intended to serve as a stand-alone guide to troubleshooting the AppleShare™ file server. We recommend the following manuals as the main references for AppleShare troubleshooting.

Documentation Available

The following Apple® manuals are an absolute necessity for anyone attempting to troubleshoot an AppleShare installation:

- *AppleShare Administrator's Guide*—This manual includes overviews of AppleShare; installation procedures for both the AppleShare software and file server hardware; start-up and shut-down procedures for the server; instructions on how to manage folders, access privileges, and users' names and passwords; administrators' duties; and an extensive troubleshooting section.

- *AppleShare User's Guide*—This manual includes an overview of AppleShare, installation procedures for AppleShare client (user) software, information on access privileges (what they are and how to use them), instructions for creating startup disks and for accessing and using AppleShare, and user-related troubleshooting information.

- *Macintosh™ Finder 5.4 Update*—This is essentially an addendum to the Macintosh and Macintosh Plus user's manuals. It contains information relating to Finder version 5.4, the new version of the Finder that is shipped with AppleShare. The document covers the new features found in the Finder such as Get Privileges in the File menu, the Access Privileges desk accessory, and the new Chooser.

❑ TROUBLESHOOTING TIPS

Installation

1. If you use the Installer application that is supplied with AppleShare to add (or later update) printing resources on your AppleShare **workstation startup disk**, you **must** always update the disk's System file (to version 3.3 or later) **after** you install the printing resources. If you don't, no printers will be available. (Refer to the *AppleShare User's Guide*, "Setting up your Macintosh" for detailed instructions.)

   Therefore, to update an existing startup disk:

   a) Add or update printing resources, if necessary (use the Installer supplied with the printer resources).

   b) Open the AppleShare Installer.

   c) Update the System file and add AppleShare resources.

2. When installing each workstation, check to make sure the time and date match those of the file server. If the times and dates don't match, users may be misinformed about file server shut-downs.

Application Compatibility

1. Applications stored on the server should be opened from folders to which the user has complete access. Many applications need temporary workspace in the folder where they reside, and may not function correctly without it.

2. Documents stored on the server should be temporarily moved to private folders while they are in use by single-user applications. This will prevent inadvertent multiuser access and potential data overwriting.

System Software Compatibility

AppleShare comes with new versions of the Finder (5.4), System (3.3), and Chooser (3.0). Everyone using the file server must upgrade to these or later versions.

Also, to reduce the possibility of incompatibilities within the customer's environment, **all users**, whether they are on the network or not, should be using the same version of system software.

Desk Accessories

When users experience problems using AppleShare, the fault can sometimes be traced to a desk accessory that manipulates the system heap in a non-standard way. If you have problems with a single workstation, try removing all non-Apple desk accessories. If the difficulties go away, add the desk accessories one at a time, testing the system after each addition, until the problem reappears. You will then have identified the problem desk accessory.

Miscellaneous Tips

1. A user cannot rename a volume, even if it is shown on his or her desktop.

2. You must not designate a volume on the server as your current startup disk. **System files cannot be shared.**

3. Users who are not using AppleShare need not upgrade to the new versions of System, Finder, or Chooser.

Apple Talk PC Card

Apple Technical Procedures

AppleTalk PC Card

Technical Procedures

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❑ PRODUCT DESCRIPTION

Overview

The AppleTalk® PC Card lets you connect IBM PC®-compatible computers to an AppleTalk local area network and use any LaserWriter® printers which are attached to that network. You can print files on the LaserWriter that were created with PC applications.

The Card

The card is a half-size board that fits into any of the empty slots in your PC. A connector on the board attaches to an AppleTalk connector box, which links your PC to the LaserWriter through the AppleTalk network.

The Software

Two MS-DOS® compatible 5.25-inch diskettes are shipped with the card. The diskettes contain programs which support the printing of documents from popular applications including WordStar®, MultiMate®, Lotus® 1-2-3®, and Microsoft® Word. Text files in ASCII format or files prepared for printing on a Diablo 630 printer can also be printed on the LaserWriter.

What's in the Box

- AppleTalk PC Card
- Startup and Applications diskettes
- *AppleTalk PC Card User's Manual*

Installation Instructions

Detailed instructions for installation of the AppleTalk PC Card can be found in the user's manual which accompanies the product.

❑ THEORY OF OPERATION

The AppleTalk PC Card can be viewed as a single board computer with a PC-compatible interface for communication with the host computer, and an AppleTalk network interface for communication with the AppleTalk Personal Network. A short description of the functions of the major integrated circuits follows.

A **65C02A microprocessor** (U4A) provides for the processing of commands and control signals from the PC, receiving/transmitting and buffering of packets from and to the network, and the handling of ATP (AppleTalk Transaction Protocol) transactions.

A **6264 8K x 8-bit static RAM** (U1A) provides working storage for the on-board 65C02A microprocessor.

A **2764 8K x 8-bit EPROM** (U3A) contains the operating firmware for the card, including AppleTalk protocol support.

An **8530 Serial Communications Controller** (U6A) converts data from serial to parallel and vice-versa and handles all control functions associated with the AppleTalk network.

A **26LS30 RS-422 Line Driver** (U8B) converts TTL level signals to an RS-422 differential signal.

A **26LS32 RS-422 Line Receiver** (U7B) converts the RS-422 differential signal to a TTL level signal.

Data Transfer

The transfer of data between the PC and the AppleTalk Card is done through one of the DMA (Direct Memory Access) channels of the computer. The card has option switches so that one of two channels may be used. Refer to the following section, "Option Switches," for further information.

Control Signals

The AppleTalk PC Card uses eight I/O ports to pass DMA and interrupt control information back and forth between itself and the PC. The starting address of these I/O ports can be changed using one of the option switches on the card. Refer to the following section, "Option Switches," for further information.

❑ OPTION SWITCHES

The AppleTalk PC Card has an eight-position DIP switch (SW1) for defining how the card will communicate with the PC. The interrupt request level, DMA channel, and I/O port addresses are selected using these switches, as shown in the following table:

Switch	Function
1	Interrupt Request - Level 4
2	Interrupt Request - Level 3
3	Interrupt Request - Level 2
4	DMA Request - Channel 3
5	DMA Request - Channel 1
6	DMA Acknowledge - Channel 3
7	DMA Acknowledge - Channel 1
8	I/O Port Addresses $24X (switch ON) I/O Port Addresses $22X (switch OFF)

TABLE 1

Switches 1, 2, and 3 determine the priority level at which the card will interrupt the processor to indicate that the card requires servicing. Only one interrupt request level should be selected. A "level 2" interrupt is the highest priority, "level 4" is the lowest.

Switches 4 through 7 determine which DMA channel the card will use. Only one DMA channel should be selected. Also, the DMA Request and DMA Acknowledge channels **must match**.

Switch 8 selects the range of I/O port addresses to be used. Setting the switch ON selects ports $240 through $247. Setting the switch OFF selects ports $220 through $227.

Standard Setup

The AppleTalk PC Card is shipped from the factory with SW1 set to use interrupt request level 3, DMA channel 1, and I/O port addresses $240 through $247.

The switches should be set as follows:

Switches 2, 5, 7, and 8	ON
Switches 1, 3, 4, and 6	OFF

These switch settings should not need to be changed unless another card is installed that use any of the same items listed above. In that case, you will have to change the setup of one of the cards.

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AppleTalk PC Card

Section 2 – Troubleshooting

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❑ INTRODUCTION

General Information

Most failures of the AppleTalk PC Card are quickly and easily solved by exchanging the defective card for a new one. Do not attempt to repair circuitry on the card.

However, do keep in mind that many "failures" can be attributed to non-hardware faults. So before exchanging the card, look for things like incorrect DIP switch setup, conflicting cards, and software problems. Be especially concerned with these kinds of failures if you are troubleshooting during the installation process.

Before You Start

Read the section titled "Things to Remember" before you begin troubleshooting. There are a number of tips and suggestions which will aid you in quickly and accurately diagnosing the failure and implementing the remedy.

❑ THINGS TO REMEMBER

Safety Precautions

1. Follow the basic ESD precautions when troubleshooting. Refer to the *You Oughta Know* tab in the *Apple Service Technical Procedures* manuals for more information.

2. Be sure the power is off before installing or removing the card.

3. Refer to the manuals which came with the computer you are working with for any additional safety information.

Helpful Hints

1. The card may be installed in any slot with the exception of slot 8 of an IBM PC-XT® or PC-XT compatible.

2. The card uses COM2 to communicate with DOS. You will need to change one card or the other if any other cards installed in the system also use COM2.

   Note: You will need to refer to the documentation that comes with the other cards to determine if they use COM2 to talk to DOS. If they do, the information to change from COM2 will also be there.

3. If you are installing the card in an IBM PC-AT® or PC-AT compatible, interrupt level 2 **cannot** be used.

4. If the system displays problems after installation of the AppleTalk PC Card—for example, the system "hangs" while loading DOS, or a serial port that did work doesn't work any more—the cause may be incompatibility between two cards. Remove all the cards but those that are absolutely necessary (such as the display adapter, floppy/hard disk controllers and the AppleTalk PC Card) and try the system again.

...Continued on next page

Then install the other cards, one at a time, trying the system after each. When you install a card that causes the system to "misbehave," check the setup of that card to answer these questions:

- Does it use the same I/O port addresses?
- Does it use the same DMA channel?
- Does it use the same interrupt lines?
- Does it use COM2?

If you answer yes to any of these questions, you will need to modify the setup of either the AppleTalk PC Card or the other card. Refer to Section 1, Basics for further information on changing the standard setup of the AppleTalk PC Card.

❑ SYMPTOM/CORRECTIVE ACTION CHART

How to Use the Symptom Chart

The symptom chart has two columns. The left column lists a symptom, the right column lists corrective action(s). For each symptom, perform the corrective action(s) in the order listed. If a corrrective action does not fix the problem, proceed to the next step.

In addition to the symptoms presented here, additional troubleshooting information is available in the *AppleTalk* section of the *Apple Service Technical Procedures.*

Network Problems

• *No zones or LaserWriters found*	1. Check AppleTalk connection. 2. Verify option switch settings. 3. Check for duplicate I/O addresses, interrupt levels, or DMA channels. 4. Exchange card.
• *System hangs when accessing network*	1. Verify option switch settings. 2. Exchange card.

Compatibility Problems

• *System hangs while booting from the hard disk*	1. Change option switches to DMA channel 1. 2. Exchange card.
• *Cards which worked* before don't work now	1. Check for duplicate I/O addresses, interrupt levels, or DMA channels. 2. Exchange card.